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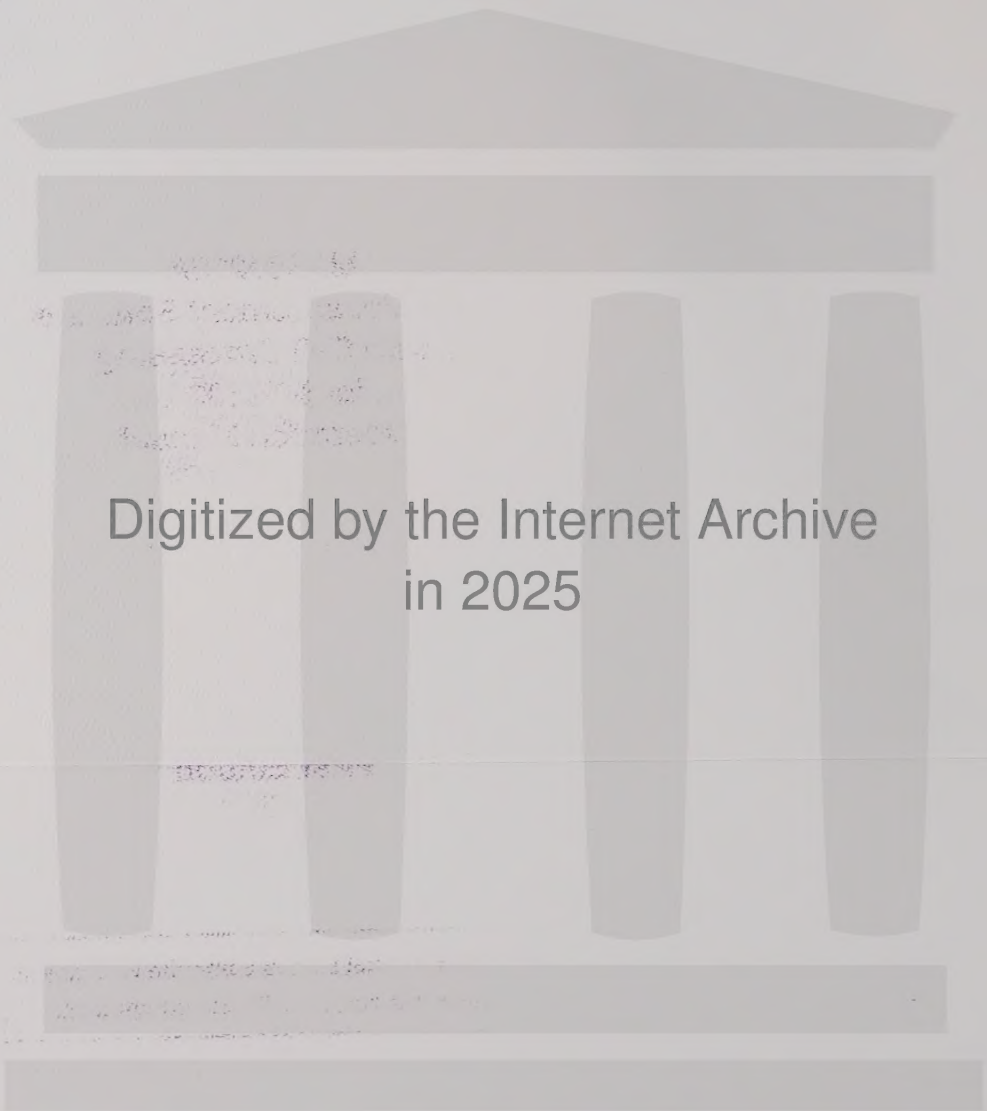

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MX880216A
PDC Measurement Software with Call Processing for MT8802A Operation Manual

First Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Measuring Instruments Division
Measurement Group
ANRITSU CORPORATION

Document No.: M-W1539AE-1.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
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Symbols used in manual

DANGER ⚠ This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

WARNING ⚠ This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION ⚠ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

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This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

MT8802A Radio Communication Analyzer
MX880216A PDC Measurement Software with Call Processing
Operation Manual

15 October 1998 (First Edition)

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For Safety

WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

WARNING ⚠

Battery fluid

5. DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.

   This fluid is poisonous.

   DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

LCD

6. This instrument uses a Liquid Crystal Display (LCD);
   DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
   This liquid is very caustic and poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

CAUTION ⚠

Changing Fuse

CAUTION ⚠

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T□□□A indicates a time-lag fuse.
   □□□A or F□□□A indicates a ordinary melt type fuse.
   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

Cleaning

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Heavy weight

⚠ CAUTION
>18 kg
Heavy weight

3. Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.

Check Terminal

4. Never input a signal of more than the specified voltage between the measured terminal and ground. Input of an excessive signal may damage the equipment.

5. Do not take out the floppy disk if LED lamp of the floppy disk drive is on. If it is taken out, the contents of the storage medium will be damaged, resulting in floppy disk drive failure.

For Safety

CAUTION ⚠

Memory Back-up Battery

6. The power for memory back-up of the MT8802A is supplied by a poly-carbomonofluoride lithium battery. this battery should only be replaced by a battery of the same type; since replacement can only be made by Anritsu, contact the nearest Anritsu representative when replacement is required.
At the end of it's life, the battery should be recycled or disposed properly.
Note: The Battery life is about 7 years. Early battery replacement is recommended.

Storage Medium

7. The MT8802A stores data and programs using a floppy disk (FD), memory card (MC), and backed-up memories.
Data and programs may be lost due to improper use or failure.
Anritsu therefore recommends that you back up the memory.
ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points. Do not remove the floppy disk from the equipment being accessed.

(FD)
- Do not touch the FD directly or by using any object.
- Do not place the equipment where dirty and dusty.
- Isolate the FD and memory card from static electricity.
- Avoid to placing the FD in direct sunlight or near heating sources.
- Store under temperature of 40˚ to 54˚C, humidity of 8 to 90% (No condensation).

(Memory card)
- Isolate the memory card from static electricity.

(Backed-up memory)
- Isolate the memory from ststic electricity.

Disposing of The Product

8. The MT8802A uses chemical compound semiconductor including arsenic.
At the end of its life, the MT8802A should be recycled or disposed properly according to the local disposal regulations.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory of Metrology and the Communications Research laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault.
When this software alone is purchased, Anritsu will repair or exchange this software free-of-charge at the company's own discretion if it provides defective within 1 year after purchase when used as described in the operation manual.
This warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to misoperation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

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Front Panel Power Switch

To prevent malfunction caused by accidental touching, the front power switch of this equipment turns on the power if it is pressed continuously for about one second in the standby state. If the switch is pressed continuously for one second in the power-on state, the equipment enters the standby state.

In the power-on state, if the power plug is removed from the outlet, then reinserted into it, the power will not be turned on. Also, if the lines is disconnected due to momentary power supply interruption or power failure, the power will not be turned on (enters the standby state) even if the line is recovered.

This is because this equipment enters the standby state and prevents incorrect data from being acquired when the line has to be disconnected and reconnected.

For example, if the data acquisition requires a long time at the BER measurement, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power-on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Further, if this equipment is built into a system and the system power has to be disconnected then reconnected, the power for this equipment must also be restored by pressing the front power switch.

Consequently, if this equipment is built into remote monitoring systems that use MODEMs, the standby function of this equipment must be modified.

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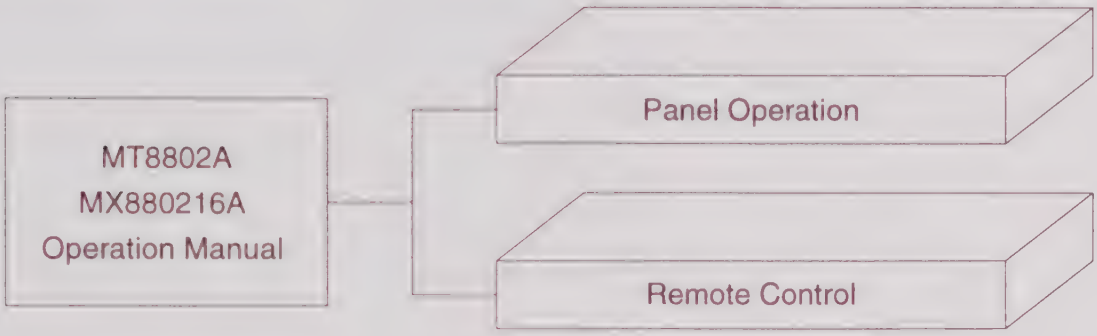
ABOUT THIS MANUAL

(1) This manual describes the operation of the MT8802A Radio Communication Analyzer using the measurement software installed.

(2) MX880216A Operation Manual

The MT8802A Radio Communication Analyzer and MX880216A PDC Measurement Software with Call Processing operation manuals consist of the following two manuals. Use the manuals matching the usage objective.



Panel operation: Outlines the MT8802A and describes its preparations, panel explanations, operations, performance text, calibrations, storage and transportation.

Remote Control: Describes RS-232C/GPIB remote control and the sample programs etc.

II.

MX880216A
PDC Measurement Software with Call Processing for MT8802A
Operation Manual (Panel Operation)

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GENERAL

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1.1 General

The MT8802A Radio Communication Analyzer is a measuring-instrument platform that consists of the hardware components necessary for testing mobile telecommunication terminals. Using the MT8802A along with the optionally available measurement software allows you to evaluate the performance of mobile telecommunication equipment with efficiency.

By using measurement software MX880216A, you can use the MT8802A as an integrated measuring instrument (hereafter called this analyzer) that can evaluate the functions and performance of the mobile telecommunication equipment conforming to PDC (Personal Digital Cellular: Japanese digtal cellular specifications).

This analyzer is provided with measurement functions such as mobile-station (MS) control, transmission measurement, error rate(reception) measurement, and sequence monitor. Only this analyzer is adequate to test the PDC mobile station for transmission and reception.

Measurement functions offered by this analyzer are as follows:

- Mobile station control: A mobile station can be placed in a PDC-specified measurement state by performing call processing.
- Transmission measurement: PDC-specified RF modulated signals (e.g., carrier frequency, signal level and modulation accuracy) can be measured.
- Reception measurement: A BER (Bit Error Rate) can be measured by demodulated data from a mobile station, allowing the receiving sensitivity of the mobile station to be measured based on the measured BER.
- Sequence monitoring: A performance test can be conducted for Call Processing, such as origination, termination, release and hand-over.

This analyzer is equipped with a high-speed digital signal processing technology, allowing you to carry out transmission and reception measurements quickly and with high accuracy.

1.2 Manual Composition

This manual is made up of the following sections.

Section 1 General

Describes the introduction, composition, function specifications and performance of this instrument.

Section 2 Preparations before Use

Explains various work to be performed before using this instrument.

Section 3 Panel Layout and Overview of Operation

Explains the basic items for operating this equipment.

Section 4 Operation

Explains basic operation and how to operate for each measurement item.

Section 5 Performance Test

Explains the performance test method for this instrument.

Section 6 Calibration

Describes calibration items and methods for the periodical calibration of this equipment.

Section 7 Storage and Transportation

Describes how to store and transport this equipment.

Appendix A Screens and Function Key Transition Diagrams

Appendix B Initial Values

Appendix C Index

1.3 Equipment Configuration

This paragraph describes the configuration of the MX880216A standard accessories.

1.3.1 Standard configuration

The table below shows the configuration of the MX880216A with the standard accessories.

Table 1-1 MX880216A standard accessories

Item	Order No.	Name	Qty	Remarks
Software	MX880216A	PDC measurement software	1	
Accessories	W1539AE	Operation manual	1	For PDC system

The table below shows the configuration of the MT8802A with the standard accessories.

Table 1-2 MT8802A standard accessories

Item	Order No.	Name	Qty	Remarks
Main instrument	MT8802A	Radio communication analyzer	1	
Accessories	J0576B	Coaxial cord	1	N-P·5D-2W·N-P, 1m
	J0768	Coaxial adapter	2	N-J·TNC-P
	J0017F	Power cord	1	2.6m
	J0266	Adapter	1	3 poles to 2 poles plug conversion adapter
	F0014	Fuse	2	6.3A for 100V/200V system

1.3.2 Options

The table below shows the MT8802A options.

These are sold separately.

Table 1-3 Options

Option No.	Name	Remarks
07	Spectrum Analyzer	

1.3.3 Software

The table below shows the MT8802A Software.

Table 1-4 Software

Option No.	Name	Remarks
MX880201A	CDMA Measurement Software	Sequence Monitor provided.
MX880213A	IS-136 Measurement Software	Sequence Monitor provided.
MX880215A	GSM Measurement Software	Sequence Monitor provided.
MX880216A	PDC Measurement Software with Call Processing	Sequence Monitor provided.
MX880217A	PHS Measurement Software with Call Processing	Sequence Monitor provided.

1.4 Optional Accessories and Peripherals

The following table shows the optional accessories and peripherals for the MT8802A which are all sold separately.

Table 1-5 Optional Accessories and Peripherals

<optional accessories>

Model*/Order No.	Name*	Remarks
J0127C	Coaxial cord	BNC-P•RG-58A/U•BNC-P, 0.5m
J0769	Coaxial adapter	BNC-J•TNC-P
J0040	Coaxial adapter	N-P•BNC-J
J0007	GPIB connection cable	408JE-101, 1m
J0008	GPIB connection cable	408JE-102, 2m
J0742A	RS-232C cable	1m, D-sub 25pins, for PC-9800 Series personal computer of NEC Corp.
J0743A	RS-232C cable	1m, D-sub 9pins, for IBM PC/AT personal computer
MN1607A	Coaxial switch	DC to 3GHz, 50Ω, externally controllable
MA1612A	4-Port junction pad	5 to 3000MHz
J0395	Attenuator for high power	30dB, 30W, DC to 8GHz
B0329D	Protective cover	
B0331D	Front handle kit	2 pcs/set
B0332	Coupling plate	4 pcs/set
B0333D	Rack mounting kit	
B0334D	Carrying case	With casters and protective cover

* Please specify the model/order number, name, and quantity when ordering.

<Peripherals and applicable units>

Model*/Order No.*	Name*
MS8606A	Digital mobile radio transmitter tester
MS2602A	Spectrum analyzer
MG3670B	Digital modulation signal generator

* Please specify the model/order number, name, and quantity when ordering.

1.5 Specifications

The MT8802A specifications are listed Tables 1-6 to 1-7 below.

Table 1-6 MT8802A Specifications (1/3)

General	Frequency range		300 kHz to 3 GHz
	Maximum input level		+40 dBm (10 W) (MAIN connector) +20 dBm (100 mW) (Auxiliary input connector)
	Input/output connector	MAIN I/O connector	N-type connector Impedance 50Ω, VSWR ≤1.2 (Frequency ≤2.2 GHz) VSWR ≤1.3 (Frequency >2.2 GHz)
		Auxiliary input connector, Auxiliary output connector	TNC connector
	Reference oscillator	Frequency	10 MHz
		Starting characteristic	$\leq 5 \times 10^{-8}$/day After 10 minutes of warm-up, refered to frequency after 24 hours of warm-up
		Aging rate	$\leq 2 \times 10^{-8}$/day $\leq 1 \times 10^{-7}$/year Refered to frequency after 24 hours of warm-up
		Temperature characteristic	5×10^{-8} (0 to 50°C) Refered to frequency at 25°C
		External standard input	10 MHz or 13 MHz (within ±1 ppm), Input level: 2 to 5 Vp-p
Signal generator	Frequency	Frequency range	10 MHz to 3 GHz
		Resolution	1 Hz
		Accuracy	Accuracy of reference frequency ±100 mHz
	Output level	Level range	−133 to −13 dBm (MAIN connector) −133 to +7 dBm (Auxiliary output connector)
		Level accuracy	±1 dB (≥−123 dBm, 18 to 28°C), ±3 dB (≥−133 dBm) (10 MHz ≤ Frequency ≤2.2 GHz) ±2 dB (≥−123 dBm, 18 to 28°C), ±4 dB (≥−133 dBm) (2.2 GHz < Frequency)
	Signal purity	Spurious	≤−50 dBc (at CW), offset frequency: 100 kHz to 50 MHz Where, Carrier frequency: Other than 1300 MHz to 1400 MHz, and 2000 MHz to 2100 MHz ≤−40 dBc for all band
		Harmonics	≤−25 dBc (at CW)
	FM modulation	Frequency deviation	0 to 40 kHz, resolution: 10 Hz
		Accuracy	±5% of set value ±1 digit (Internal modulation frequency: 1 kHz, excluding residual FM)
		Internal modulation frequency	20 Hz to 20 kHz
		External modulation frequency	20 Hz to 20 kHz
		Frequency characteristics	±0.5 dB (Refered to 1 kHz as reference, 0.3 to 3 kHz, frequency deviation: 4 kHz) ±1 dB (Refered to 1 kHz as reference, 20 Hz to 20 kHz, frequency deviation: 4 kHz)
		Modulation distortion	<−50 dB (Internal modulation frequency: 1 kHz, frequency deviation: 5 kHz, demodulation band: 0.3 to 3 kHz)
		External modulation	Input level: 1 V peak (terminated voltage), input impedance: 600Ω

Table 1-6 MT8802A Specifications (2/3)

(Cont.)

AF oscillator (2 routes)	Frequency	Range	20 Hz to 20 kHz
		Resolution	0.1 Hz
		Accuracy	Sychronized to standard crystal oscillator
	Output	Level range	0.01 µV rms to 3 V rms (EMF) (main Output impedance: 600Ω) 0.01 µV rms to 0.3 V rms (EMF) (main output impedance: 50Ω)
		Resolution	1 µV (output level ≤4 mV) 10 µV (output level ≤40 mV) 100 µV(output level ≤0.4 V) 1 mV (output level ≤3 V)
		Accuracy*	Unbalanced output : ±0.5 dB (frequency: 1 kHz, output level ≥1 mV) Floating output : ±2 dB (frequency: 1 kHz, output level ≥1 mV) Unbalanced output : ±1 dB (20 Hz ≤ frequency ≤20 kHz, output level ≥1 mV) * Measured at <30 kHz bandwidth
		Output impedance	Main Output : 600Ω/50Ω changeable, Unbalanced, BNC Mike Input use : 600Ω (floating), DUT Interface
		Waveform distortion	<–50 dBc (frequency: 1 kHz, output level: 1 V) <–45 dBc (20 Hz ≤ frequency ≤20 kHz, output level: 1 V) * Measured at <30 kHz bandwidth
	Noise generator		White noise through evaluation filter (ITU-T recommendation: G.227)
RF analyzer	Power meter (narrow-band)	Frequency range	10 MHz to 3 GHz
		Level range	0 to +40 dBm (MAIN connector) –40 to +20 dBm (AUX connector)
		Accuracy	±10% (MAIN connector, after calibration with built-in wide-band power meter)
		Lineanty	±0 3 dB (0 to –30 dB)
	Frequency counter	Frequency range	10 MHz to 3 GHz
		Input level range	–20 dBm to +40 dBm (MAIN connector) –40 dBm to +20 dBm (AUX connector)
		Resolution	1 Hz
		Accuracy	± (Accuracy of standard crystal oscillator +10 Hz)
		Measurement method	Measurement by IF frequency, reception band: ±30 kHz
FM/øM measurement	Frequency range		10 MHz to 3 GHz
	Input level range		–20 dBm to +40 dBm (MAIN connector) –40 dBm to +20 dBm (AUX connector)
	Band limited filter		HPF : 50 Hz, 300 Hz (3-dB loss point) LPF : 3 kHz, 15 kHz (3-dB loss point)
	FM measurement	Frequency deviation	0 to 20 kHz
		Demodulation frequency range	30 Hz to 20 kHz
		Accuracy	1% of indicated value + residual FM (Demodulation frequency: 1 kHz)
		Frequency characteristics	±0.5 dB (Refered to demodulation frequency: 1 kHz as reference)
		Residual FM	8 Hz rms (demodulation band: 0.3 to 3 kHz)
		Demodulation distortion	0.3% (Demodulation frequency: 1 kHz, frequency deviation: 5 kHz, demodulation band: 0.3 to 3 kHz)

Table 1-6 MT8802A Specifications (3/3)

(Cont.)

FM/øM measurement	øM measurement	Phase deviation	0 to 10 rad
		Demodulation frequency range	300 Hz to 3 kHz
		Accuracy	1% of indicated value + residual øM (Demodulation frequency: 1 kHz)
		Frequency characteristics	±0.5 dB (Refered to demodulation frequency: 1 kHz as reference)
		Residual øM	0.01 rad rms (demodulation band: 0.3 to 3 kHz)
		Demodulation distortion	0.50% (Demodulation frequency: 1 kHz, phase deviation: 5 rad, demodulation band: 0.3 to 3 kHz)
	FM demodulation output	Frequency deviation	0 to 40 kHz (range: 4/40 kHz)
		Demodulation frequency range	50 Hz to 10 kHz
		Output level	4 V peak (EMF) (for full-scale input of range)
		Output impedance	600Ω
		Frequency characteristics	±1 dB (refered to demodulation frequency: 1 kHz as reference)
		Demodulation distortion	1% (Demodulation frequency: 1 kHz, frequency deviation: 4 kHz, 4 kHz range, demodulation band: 0.3 to 3 kHz)
		Band limited filter	HPF : 300 Hz (3-dB loss point) LPF : 3 kHz (3-dB loss point) De-emphasis: 750 µs
Audio analyzer	Input impedance		600Ω/100kΩ changeable, Unbalanced, BNC
	Band limited filter		HPF : 400 Hz (for tone rejection) De-emphasis: 750 µs
	Evaluation filter		ITU-T P.53 and C-MESSAGE, selectable
	AF level measurement	Frequency range	30 Hz to 20 kHz
		Input level range	1 mV rms to 30 V rms
		Accuracy	±0.5 dB
	Distortion rate measurement	Frequency range	100 Hz to 5 kHz
		Input level range	30 mV rms to 30 V rms
		Accuracy	±1 dB (frequency: 1 kHz, distortion rate: 1%)
	AF frequency measurement	Frequency range	30 Hz to 20 kHz
		Level range	30 mV rms to 30 V rms
		Accuracy	±0.1 Hz
Others	Display		Color TFT LCD display Size: 7.8 inches Number of dots: 640 × 480
	Hard copy		Enables data hard copy on the display through a parallel interface. (applicable printer: ESC/P type)
	External control	GPIB	Function: This equipment is specified as a device, can be controlled from external controller. (excluding power switch and FD ejection key) No controller function Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, and E2
		Parallel	Function: Conforms to the Centronics. Outputs printing data to a printer. Data line exclusive for output: 8 Control line: 4 (BUSY, $\overline{\text{DTSB}}$, $\overline{\text{ERROR}}$, PE) Connectors: D-sub 25 pins
		RS-232C	Controlled from an external controller (except for the power switch and ejector of FD) Baud rate: 1200, 2400, 4800, or 9600 bps
Dimensions	Dimensions		221.5 mm (H) × 426 mm (W) × 451 mm (D)
Mass	Mass		≤27 kg
Power supply	Power supply		100 to 120 V, 200 to 240 V 47.5 to 63 Hz, ≤300 VA Automatic voltage switch system
	Operating temperature range		0 to 50°C

Table 1-7 MX880216A: PDC Measurement Software with Call Processing Specifications (1/2)

Transmission measurement	Modulation/ frequency measurement	Frequency range		10 MHz to 2.2 GHz
		Input level range		–10 to +40 dBm (Average power within burst) : MAIN connector –30 to +15 dBm (Average power within burst) : AUX Input connector
		Carrier frequency		Accuracy: ±(accuracy of the reference frequency +1 Hz)
		Modulation accuracy		Accuracy: ±(2% of indicated value +0.5%)
		Origin offset		Accuracy: ±0.5 dB (to a signal level of –30 dBc)
		Transmission rate		Accuracy: ±1 ppm Measurement range: 42 kbps±100 ppm
		Waveform display		Constellation display
	Amplitude measurement	Frequency range		10 MHz to 2.2 GHz
		Input level range		+10 to +40 dBm (Average power within burst): MAIN connector
		Transmission power		Accuracy: ±10% (MAIN connector) (after calibration by using built-in power meter)
		Carrier-off power	Normal mode	Measurement range: ≥65 dB (compared with burst average power)
			Wide dynamic range mode	Measurement range: ≥95 dB (compared with 3 W of burst average power) Measurment limit is decided by average noise level (≤-60 dBm, 100 MHz to 2.1 GHz).
		Rise/fall charactenstic		Displays rising/falling edges while synchronizing to modulation data of signal to be measured. Standard line display possible. Raising/falling time measurement (measured by 100 kHz bandwidth)
	Occupied bandwidth measurement	Frequency range		10 MHz to 2.2 GHz
		Input level range		+10 to +40 dBm (Average power within burst): MAIN connector
		Measurement	Standard mode	Measurement: Displays results of occupied bandwidth calculation after measuring a signal with sweep-type spectrum analyzer.
			High-speed mode	Measurement: Displays results of occupied bandwidth calculation after FFT transform of a signal (1 burst) under measurement.
	Adjacent channel leakage power measurement	Frequency range		100 MHz to 2.2 GHz
		Input level range		+10 to +40 dBm (average power within burst): MAIN connector
		Measurement	Standard mode	Measurement: Displays results of adjacent channel leakage power calculation after measuring a signal with sweep-type spectrum analyzer.
			High-speed mode	Measurement: Displays results of adjacent channel leakage power calculation after spectrum analyzer simulation analysis of signal (one burst).
		Measurement range	Standard mode	50 kHz offset: ≥60 dB 100 kHz offset: ≥65 dB
			High-speed mode	50 kHz offset: ≥60 dB 100 kHz offset: ≥65 dB
	All measurement items	Frequency range		Same as each the measurement item.
		Input level range		Same as each the measurement item.
		Measurement item		Transmission frequency Modulation accuracy Origin offset Transmission rate Transmission power Carrier off power Rise/fall time Occupied bandwidth Adjacent channel leakage power
		Measurement time		≤1.5 seconds Note that amplitude measurement is done in normal mode; occupied bandwidth measurement and adjacent channel leakage power measurement are done in high-speed mode.
				≤2 seconds Note that amplitude measurement is done in wide dynamic range mode; occupied bandwidth measurement and adjacent channel leakage power measurement are done in high-speed mode. (The time from the start to completion (SRQ signal generation) of measurement by GPIB control)

Table 1-7 MX880216A: PDC Measurement Software with Call Processing Specifications (2/2)

(Cont.)

Reception measurement	Signal generator	Frequency range	10 MHz to 3 GHz
		Level range	–133 to –13 dBm (MAIN connector) –133 to +7 dBm (Auxiliary Output connector)
		Modulation system	$\pi/4$ DQPSK, α=0.5 (Root Nyquist filter)
		Modulation accuracy	≤3% rms
		Burst repeat period	20 ms (Full rate), 40 ms (Half rate) Note that one burst is outputted in one frame.
		Modulation data	Continuous waveform output: • PN9 and PN15 pseudo-random patterns and arbitrary 4-bit data repetitive patterns Burst waveform output: • Downlink communication channel patterns • Data editing in slots possible.
	Error rate measurement	Function	Error rate measurement is done by synchronizing to modulated data of signal generator.
		Measurement pattern	PN9 and PN15
		Input level	TTL (NRZ)
		Measurement time	10^2, 2556, 10^3, 10^4, 10^5, 10^6, ∞bits
		Input terminal	BNC (rear panel) or DUT Interface (front panel)
Call processing	Executes call prosessing of location registration, origination, termination, communication, handover, disc from MS and disc from NW.		

SECTION 2
PREPARATIONS BEFORE USE

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2.1 Installation Site and Environmental Conditions

The MT8802A Radio Communication Analyzer operates normally at temperatures from 0° to 50°C. However, for the best performance, the following locations should be avoided.

- Where there is severe vibration
- Where the humidity is high
- Where the equipment will be exposed to direct sunlight
- Where the equipment will be exposed to active gases

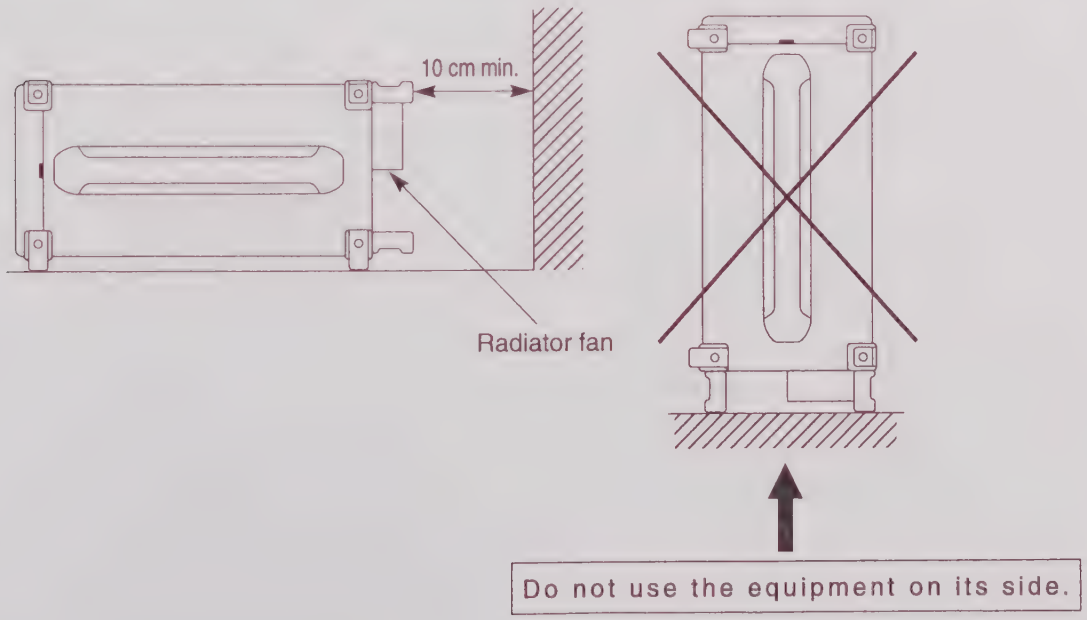
To insure long-term trouble-free operation, the equipment should be used at room temperature and in a location where the power supply voltage does not fluctuate greatly.

CAUTION ⚠

• Prevention of failure due to condensation
If the MT8802A is used at normal temperatures after it has been used or stored for a long time at low temperature, there is a risk of short-circuiting caused by condensation.
To prevent this risk, do not turn the power on until the MT8802A has been allowed to dry out sufficiently.

Fan clearance:

To suppress any internal temperature increase, the MT8802A has a fan on the rear panel as shown in the diagram below. Leave a gap of at least 10 cm between the rear panel and the wall, nearby equipment or obstructions so that fan ventilation is not blocked.



2.2 Safety Measures

This paragraph explains the safety procedures which should be followed under all circumstances to counter the risk of an accidental electric shock, damage to the equipment or a major operation interruption.

2.2.1 Safety measures for power supply

WARNING ⚠

Before power-on:	• Protective grounding The MT8802A must be connected to ground. If the power is turned on without taking this countermeasure, there is a risk of receiving an accidental electric shock. • Power supply voltage In addition, it is essential to check the power supply voltage. If an abnormal voltage that exceeds the specified value is input, there is an accidental risk of damage to the MT8802A and fire.
During power on:	• To maintain the MT8802A, sometimes it is necessary to make internal checks and adjustments with the top, bottom or side covers removed while power is supplied. Very-high, dangerous voltages are used in the MT8802A; if insufficient care is taken, there is a risk of an accidental electric shock being received or of damage to the equipment. To maintain the MT8802A, request service by service personnel who has received the required training.

In the following, special notes on safety procedures are explained for sections other than Section 2. To prevent accidents, read this section together with the related sections before beginning operation.

2.2.2 Maximum power to connector

The allowable maximum power to the MT8802A connectors are as follows.

Connector	Allowable maximum power
Main Input/Output	10 W (40 dBm)
AUX Input	100 mW (20 dBm)
AUX Output	Exclusive output connector, 0.5 mW (-3 dBm)
AF Input	30 Vrms
AF Output	Dedicated output connector, 5 Vrms (output impedance : 600 Ω), 0.5 Vrms (output impedance : 50 Ω)
DUT Interface	TTL level
Reference Input	2 to 5 Vp-p
10MHz Buffered Output	Dedicated output connector, TTL level
Detector Output	Dedicated output connector, TTL level
BER Input connectors	TTL level
Ext Trig Input	TTL level
Ext Trig Output	Dedicated output connector, TTL level
Ext FM Input	±10 Vp-p
Demod Output	Dedicated output connector, ±8 Vp-p

CAUTION ⚠

- **Excessive power protection**
  Never apply power more than the allowable maximum power. Also, do not input external signal to the output connector.

2.3 Preparations before Power-on

The MT8802A operates normally when connected to 100 to 120 Vac, 47.5 to 63 Hz, or 200 to 240 Vac, 47.5 to 63 Hz AC power supply via the power inlet.

To prevent the following problems, take the necessary procedures described on the following pages before power is supplied.

- Accidental electric shock
- Damage caused by abnormal voltage
- Ground current problems

To protect the operator, the following WARNING and CAUTION notices are attached to the rear panel of the MT8802A.

WARNING ⚠
NO OPERATOR SERVICE-ABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED PERSONNEL.

WARNING
Disassembly, adjustment, maintenance, or other access inside this instrument by unqualified personnel should be avoided. Maintenance of this instrument should be performed only by Anritsu trained service personnel who are familiar with the risks involved of fire and electric shock.

CAUTION ⚠
FOR CONTINUED FIRE PROTECTION REPLACE ONLY WITH SPECIFIED TYPE AND RATED FUSE.

CAUTION
Replace only with fuses of the specified type and rating. The use of improper fuses may cause fire.

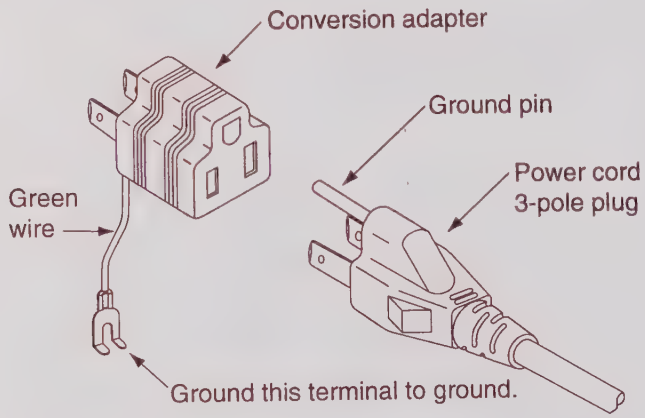
2.3.1 Protective grounding

(1) Grounding with 3-pole power outlet

The power supply polarity of the 3-pole (grounded, 2-pole type) matches that of the 3-core power cord plug. Therefore, the MT8802A is connected to ground potential when the power cord is connected to the plug. As a result, it is not necessary to connect the FG terminal to ground.

(2) Grounding with conversion adapter

If a 3-pole power socket is not provided, use the 3-pole to 2-pole conversion adapter as shown in the figure below. Connect the green wire protruding from the 3 to 2 conversion adapter to ground.

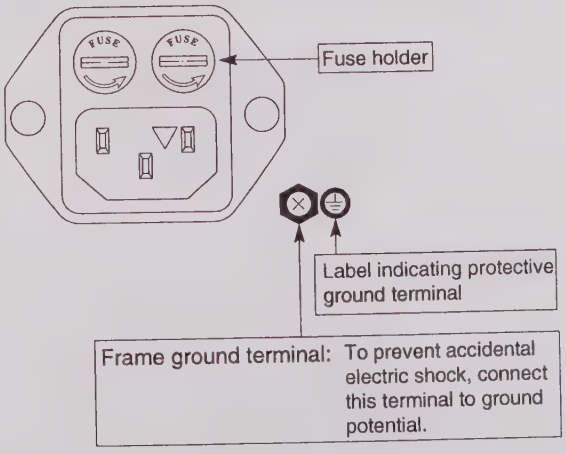


(3) Grounding with frame ground (FG) terminal

If a 3-pole ac power supply outlet is not available and the green wire cannot be grounded, the protective frame ground (FG) terminal on the rear panel must be connected directly to ground potential.

WARNING ⚠

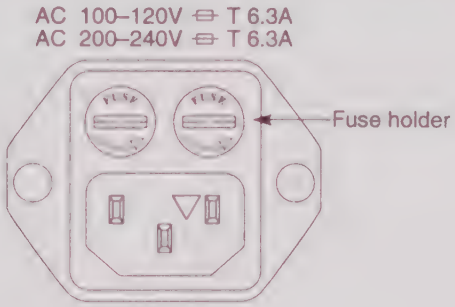
- Prevention of danger using protective ground terminal
  If power is supplied without protective grounding, there is a risk of accidental electric shock. If a 3-pole power supply outlet is not available and the green wire cannot be grounded, the protective frame-ground (FG) terminal on the rear panel must be connected to ground potential before power is supplied to the MT8802A.


FUSE
FUSE
Fuse holder
Label indicating protective ground terminal
Frame ground terminal: To prevent accidental electric shock, connect this terminal to ground potential.

2.3.2 Replacing fuse

The MT8802A with standard accessories has two spare fuses (T6.3A250V). Use these fuses to replace the blown fuses. If the fuses must be replaced, locate and remedy the cause before replacing the blown fuses.

Power supply system	Voltage range	Fuse rating plate	Fuse rating	Fuse name	Model/Order No.
100 Vac	100 – 120V	T6.3A	6.3A, 250V	T6.3A 250V	F0014
200 Vac	200– 240V	T6.3A			



WARNING ⚠

- Prevention of electric shock

Before replacing the fuses, turn the power switch off and remove the power cord from the power outlet. If the fuses are replaced while power is being supplied,there is a serious risk of electric shock.

- Confirmation before turning the power on

After replacing fuses, the protective grounding mentioned above must be provided before turning the power on again, and the proper AC power supply voltage must be confirmed. If the AC power supply voltage is improper, there is a risk of the internal circuits of the MT8802A being damaged.

CAUTION ⚠

- Check on replacing fuses

If the replacement fuses are not provided, obtain replacement fuses of the same rated voltage and current as the fuses in the fuse holders.

If the replacement fuses are not of the same type, they may not fit correctly, and failure will occur due to melting of the fuse.

When the rated voltage and current are over-sufficient, the fuses may not blow even if there is a risk of damage to the equipment by fire.

After performing the safety procedures, replace the fuses according to the following procedure.

Step	Procedure
1.	Turn off the power switches on the front and rear panels, then remove the power cord from the power supply outlet.
2.	Use a screwdriver to turn the fuse holder cap shown in the figure counterclockwise. The cap and fuse are removed together as a unit from the AC inlet.
3.	Remove the fuse from the fuse cap and replace it with a spare fuse.
4.	Return the fuse cap with the fuse to the fuse holder, then fasten it by turning it clockwise with the screwdriver.

* Contact the Anritsu service department for fuses by specifying the model name, order number, name, and quantity.

2.4 Installation

2.4.1 Rack mounting

The B0333D Rack Mounting Kit (sold separately, Table 1-3) is required to mount the MT8802A in a rack.
The installation method is included in the rack mount kit diagram.

2.4.2 Stacking

When stacking several MT8802As or stacking the MT8802A with equipment of the same width as the MT8802A, the B0332 Coupling Plate (sold separately, Table 1-3) are required.

2.5 Precautions for Handling Storage Media

2.5.1 Floppy disk

The following explains how to handle the floppy disk media of this instrument.

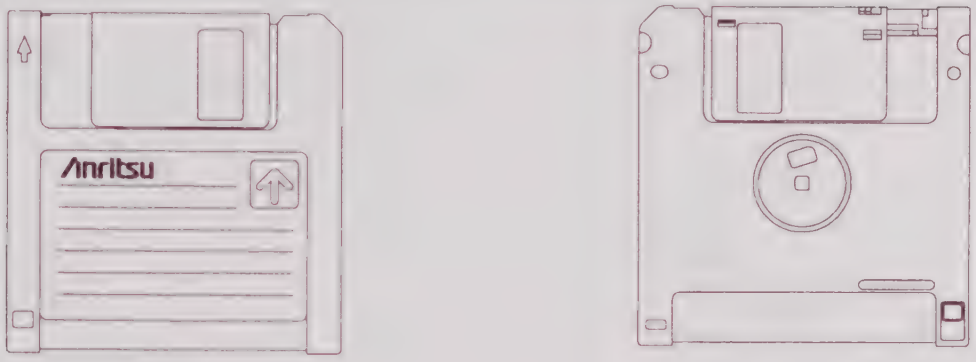


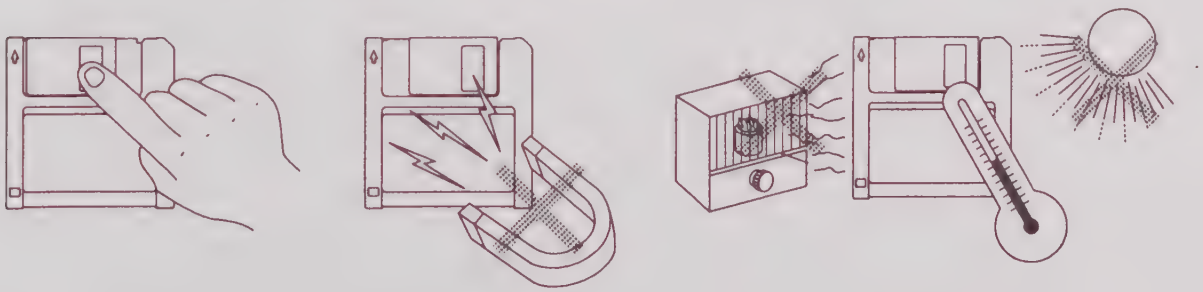
Fig. 2-1 3.5-inch Floppy Disk

(1) Precautions

The plastic case of the 3.5-inch floppy disk has a shutter to protect the disk inside. When the disk is inserted into the disk drive, the shutter opens to expose part of the disk. Do not touch the shutter.

The following care must be taken for handling the disk.

(a) When a floppy disk is inserted, and LED lamp on the disk drive lights, do not eject the disk. Otherwise, the memory contents may be damaged, resulting in disk drive failure.
(b) Do not directly touch the magnetic surface with your hand or any object.
(c) Do not expose the disk to dust.
(d) Do not place the disk near any magnetic objects.
(e) Do not place the disk in direct sunlight or near heater.
(f) Store the disk under a temperature range of 4° to 53°C, and humidity of 8 to 90% (no condensation).



(2) Write-protection tab

A write-protection tab is provided on the 3.5-inch floppy disk.

Sliding this tab downward in the arrow direction beforehand prevents accidental writing and deletion. (A write operation is disabled in this state.)

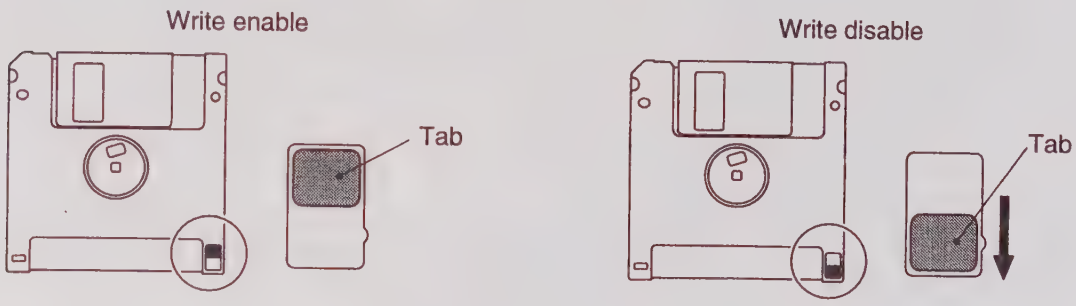


Fig. 2-2 Write-protection Tab for 3.5-inch Floppy Disk

(3) Inserting and ejecting the floppy disk

With the front surface of the floppy disk facing ups, fully insert the disk in the arrow direction until a clicking sound is heard.

To eject, press the eject button on the right side of the disk drive. Remove the disk after confirming that the LED lamp is off.

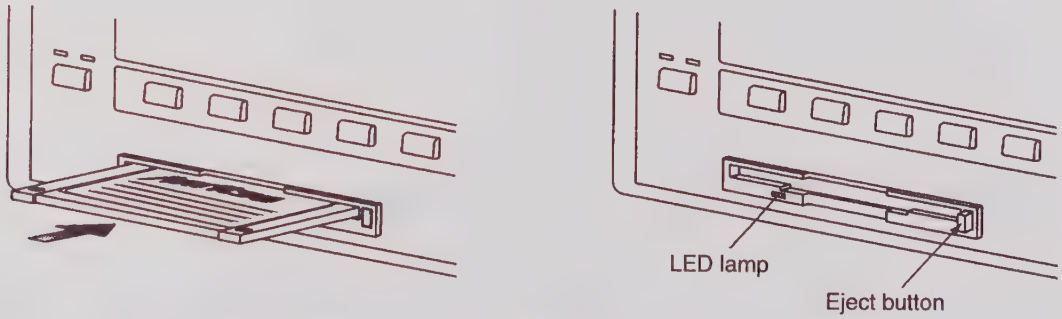


Fig. 2-3 Inserting and Ejecting the 3.5-inch Floppy Disk

SECTION 3
PANEL LAYOUT AND OVERVIEW OF OPERATION

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3.1 Panel Layout

This paragraph describes the keys, switches, LEDs, and connectors on the front and rear panels of the MT8802A Radio Communication Analyzer.

3.1.1 Front panel layout

This paragraph describes the keys, switches, LED, connectors, and the rotary knob on the front panel.

No.	Display	Function
1	F1,F2,F3,F4,F5,F6	
		Main function keys
		Group of keys that select and execute the corresponding menus displayed on the LCD screen.
		When the [Main Func] F6 key is on, the menus for F1 to F5 are placed in MT8802A measurement mode.
		When the [Main Func] F6 key is off, the menus of F1 to F5 are displayed for the currently used screen function.
2	F7,F8,F9,F10,F11,F12	
		Function keys
		Group of keys that select and execute the corresponding menus displayed on the LCD screen. These screen functions are related to the current operation.
3	Next Menu	
	▲	Displays the next page of the function key menu.
	◀	Displays the next page of the main function key menu.

No.	Display	Function outline
4		Key group for entering data.
	Shift	Switches the function of keys with a shift function. When the shift key is pressed, the key's LED goes on. Subsequent operation must be started with this LED on.
	BS	Back space key used to correct input data.
	0,.,-/+,1,2,3, A/4,B/5,C/6,D/7,E/8,F/9	Numeric keys (ten-keypad) used for data input. These keys become alphanumeric keys at shift function activation.
	(Definition key group)	The data input using the numeric keys is defined with these keys.
	W/GHz/dBm/dB	Validates data when W/GHz/dBm/dB unit system data is input.
	mW/MHz/dBμV/sec	Validates data when mW/MHz/dBμV/sec unit system data is input.
	μW/kHz/mV/ms	Validates data when μW/kHz/mV/ms unit system data is input.
	nW/Hz/μV/μs/Enter	Validates data when nW/Hz/μV/μs unit system data or non-unit system data is input.
5	Measure	Key group used to start measurement.
	Single	Key used to execute measurement once.
	Continuous	Key used to execute measurement continuously .
6	Copy	Outputs display screen to the specified printer.(Hard copy function)
7	Cursor	Key group used to control the cursor on the LCD screen.
	Set	Opens the input window for data in the item pointed to by the cursor. After the completion of data entry, the window is closed.
	Cancel	Closes the window. The input data becomes invalid.
	^ < > v	Moves the cursor.
8	Step	Key group increment or decrement numeric data.
	^	Increments numeric data by the specified step value.
	v	Decrements numeric data by the specified step value.
		Entry using these keys is always validated every time the data incremented or decremented.
9	(Rotary knob)	Knob used for data input.
		When this knob is turned clockwise, the value increases and when it is turned counterclockwise, the value decreases. For input by the rotary knob, data is validated each time it is incremented/decremented.
		This knob is also used in item selection.

No.	Display	Function outline
10	Main Input/Output	Input/output connector for RF signal.(N type connector)
11	AUX	Auxiliary input/output connectors for RF signal.(TNC connector)
	Input	Auxiliary input connector for RF signal. This is used when the output level of DUT is too low.
	Output	Auxiliary output connector for RF signal. This is used when the sensitivity of DUT is too low.
12	AF Input	AF signal input connector for Option 01(Analog), (BNC connector)
	AF Output	AF signal output connector for Option 01(Analog), (BNC connector)
13	DUT Interface	Multi-pole connector used to control the DUT and measure the BER (D-SUB connector, 25-pin, female).
14	(Floppy disk drive)	Slot in which the floppy disk is loaded for saving and recalling data, and loading system program.
15	Stby On	Change-over switch to turn the standby power supply on when the Line Input on/off switch on the rear of this instrument is turned on. In Standby mode, power is only supplied to the reference crystal oscillator.
16	Panel Lock	Invalidates all key operations except the Panel Lock key and the Stby On power supply switch on the front panel. In lock mode, the LED on this key goes on.
17	Remote Local	Resets GPIB remote mode and returns to local mode. In GPIB remote mode, the LED (Remote) goes on.
18	Preset	Initializes measurement parameters.

3.1.2 Rear panel layout

This paragraph describes the switch and connectors on the rear panel.

No.	Display	Function
19	O I	Input switch for AC power supply. If this switch is turned off, the Power switch on the front panel cannot be turned on.
20	(Fuses)	Power supply fuses. For safety, always use fuses of the specified rating.
21		Frame grounding terminal. For safety, always ground this terminal.
22	(Memory card cover)	The memory card is built-in. Close the cover for card use.
23	(Power supply inlet)	For safety, always use a power supply of the rated voltage.
24	GPIB	GPIB interface connector.
25	Parallel	Parallel interface connector (conforms to Centronics type). Used to connect printer (D-SUB connector, 25-pin, female).
26	Serial	RS232C interface connector (D-SUB connector, 9-pin, female).
27	10 MHz Buffered Output	10 MHz reference signal (TTL level) for internal use is output (BNC connector).
28	10 MHz/13 MHz Reference Input	10 MHz or 13 MHz reference signal (2 to 5 Vp-p) is input (BNC connector).
29	Detector Output	RF burst signal detection output connector (BNC connector).
30	BER Input	Signal input connectors for measuring bit error rate (BNC connector).
	Data	Input connector for measurement data of bit error rate (BNC connector). TTL level signal is input.
	Clock	Input connector for clock of bit error rate (BNC connector). TTL level signal is input.
31	Ext FM Input	External FM modulation signal input connector for analog measurement, (BNC connector)
32	Demod Output	FM demodulated signal output connector for analog measurement, (BNC connector)
33	Ext Trig Input	Input connector for external trigger signal (BNC connector). TTL level signal is input.
34	Ext Trig Output	Output connector for external trigger signal (BNC connector). TTL level signal is output.
35	(Fan)	Instrument internal air cooling fan.
36	CDMA Reference Input	Input connector for CDMA clock signal (BNC connector). TTL level signal is input.
37	CDMA Reference Output	Output connector for CDMA clock signal (BNC connector). TTL level signal is output.
38	CDMA Timing	Connector for CDMA timing (D-SUB25 connector, 25 pins, female).

3.1.3 Panel layout

The front panel and rear panel layouts are shown in Figs. 3-1 and 3-2, respectively.

The numbers in the diagram correspond to those in paragraphs 3.1.1 and 3.1.2.

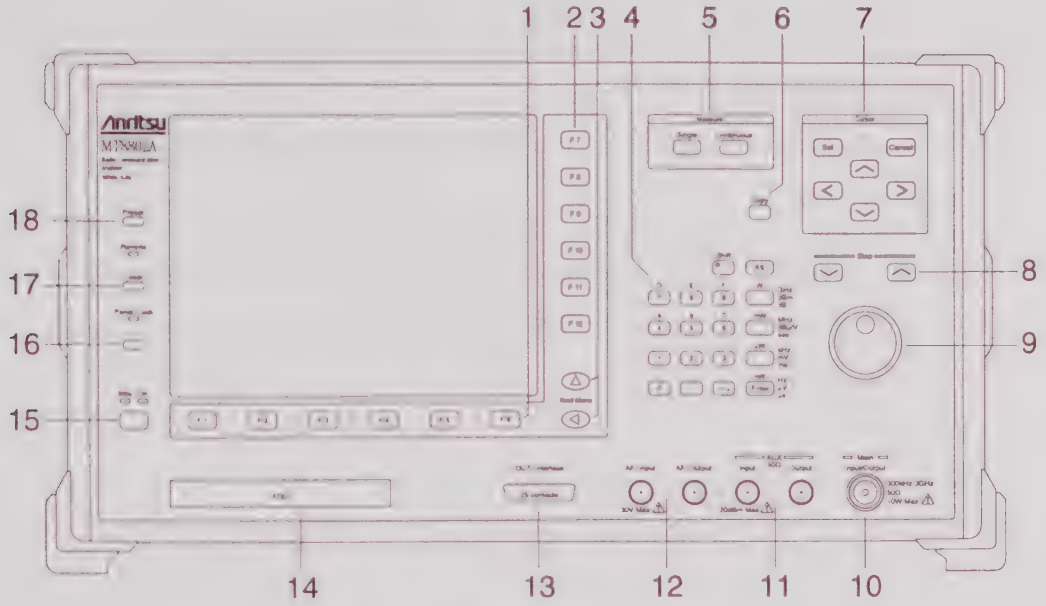

Fig. 3-1 Front Panel

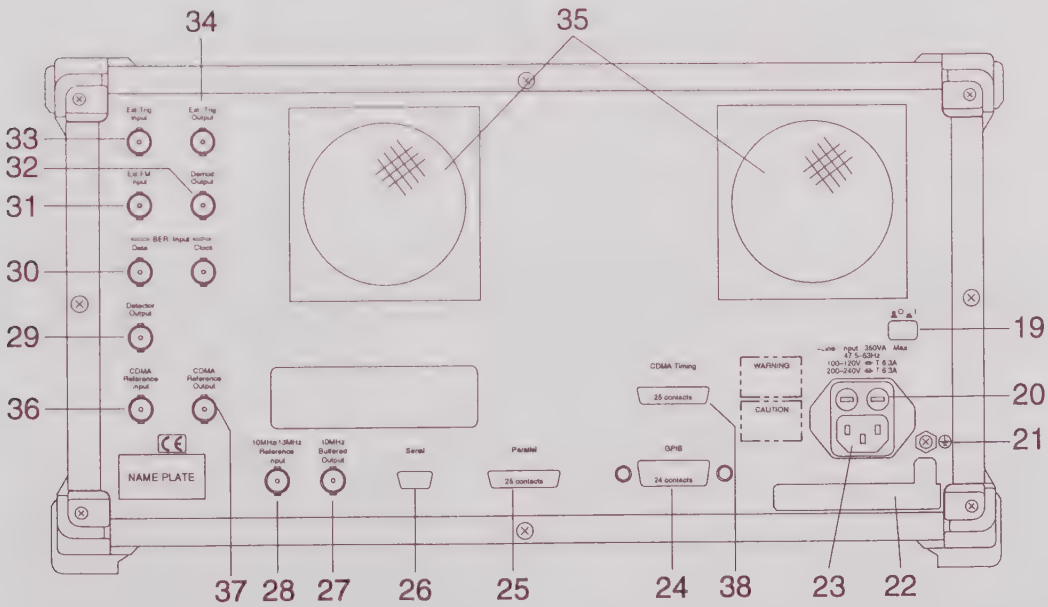

Fig. 3-2 Rear Panel

3.2 Overview of Operation

3.2.1 Overview of functions

The MT8802A with the MX880216A PDC measurement software can perform PDC TX/RX measurement.

• PDC TX/RX measurement --- TX/RX Measure mode

The following measurement can be performed by using the function menus displayed on the screen.

1. Transmitter measurement --- TX Measure mode

   The MT8802A can measure the items below by receiving RF signals from a transmitter.

   • Modulation analysis
   Carrier frequency, carrier frequency error, vector error: RMS/10-symbols/maximum-value, amplitude error, phase error, origin offset, droop factor, bit rate, bit rate error, constellation, Eye-diagram

   • RF power (with burst amplitude, standard line template): Slot, frame, rising edge, falling edge

   • Occupied frequency bandwidth

   • Adjacent channel leakage power

   • Power meter (Note: Measures the average power with a power sensor.)

   An automatic\ measurement function that performs all the selected measurements at a time by selecting some of the above items is also provided.

2. Receiver measurement--- RX Measure mode

   The MT8802A sends RF test signal to the receiver (DUT), and the receiver results are input to the MT8802A. Then the MT8802A measures the bit error rate (for reception sensitivity measurement) of the receiver.

3. Call-processing sequence monitor--- Call processing mode

   The MT8802A monitors the call-processing (location registration, origination, termination, communication, handover, Disc from MS, Disc from NW) sequence between the MT8802A and the DUT (mobile station) to judge the pass/fail of the sequence operation.

The following functions are provided to these functions.

• Save/recall

In TX Measure mode, the measurement conditions (Parameters) and RF power measurement templates (amplitude standard lines) can be saved or recalled up to 100 types to/from an FD (3.5-inch floppy disk).
Also in RX Measure mode, set output patterns up to 100 types can be saved and recalled through the FD.

• Copy

Outputs the image on LCD screen to an external printer using a parallel interface (conforming to Centronics type).

• GPIB

The MT8802A can be controlled by an external controller using the GPIB interface.

• RS232C

The MT8802A can be controlled by an external controller using a serial interface (RS232C).

3.2.2 Overview of operation

At power-on operation begins in "TX&RX Tester" (Transmitter and Receiver test) status (Setup Common Parameter screen).

(1) Main menu selection

If measurement is to be started from another mode, or from other than a measurement mode, first select one of the main menu items, as shown below.

TX&RX Tester (Transmitter and Receiver test)

Recall (Parameter file recall)

Save (Parameter file save)

File Operation (File retrieval/deletion/protect, FD initialization)

Change System (Measurement system change)

Instrument Set (MT8802A main-frame setting)

Change Color (Selection of screen color)

First press the [Main Menu On/Off] F6 key to ON, then select the desired function by using main function keys F1 to F5 and the Next Menu key [◀].

(2) Selection of measurement items

Items are set by using cursor keys ([∧],[∨],[<], [>]), and other function keys while observing the screen menu.

Press the [Set] key to open the input window.

(3) Item input

For selection items displayed: Select the required value by using the cursor keys or rotary knob.

For mumeric values: Input data using the numeric keys, and validate by pressing a unit key, [Enter] key, or [Set] key. The window closes.

(4) Outline of screen configuration

The screen configuration is shown below. A tree-shaped Hierarchical configuration of items below each the main menu is indicated. (Details of operation are explained in Section 4. The screens, setup items and function key flowchart for each screen are summarized in Appendix A, "Screen and Function Key Transition Diagrams.")

[Overview of screens]

- TX&RX Tester mode
  - Setup Common Parameter screen
    (TX/RX common measurement conditions setup screen)
    - TX Measure mode
      - Setup TX Measure parameters screen
        (Screen for setting items of TX measurement conditions)
      - Select All Measure Items screen
        (Screen for setting items of all TX measurement conditions)
      - All Measure screen
        (Screen for measuring all TX measurement items)
      - Modulation Analysis screen
        (TX modulation analysis screen-- numeric display)
        - Waveform Display screen
          (TX modulation analysis screen - 5 waveforms: Constellation, Eye Diagram, Vector Error, Phase Error, Magnitude Error)
      - RF Power screen
        (TX RF power (burst amplitude) measurement screen
        - Recall Template screen
        - Setup Template screen
          - Save Template screen
      - Occupied Bandwidth screen
        (Screen for measuring occupied bandwidth)
      - Adjacent Channel Power screen
        (Screen for measuring adjacent channel leakage power)
      - Power Meter screen
        (Screen for measuring TX RF power (average value))
    - RX Measure mode
      - Setup RX Measure Parameters screen
        (Screen for setting items of RX measurement conditions)
        - Recall Pattern screen
          (Screen for recalling MT8802A output pattern)
        - Save Pattern screen
          (Screen for saving MT8802A output pattern)
      - Bit Error Rate screen
        (Screen for measuring RX bit error rate (BER))
    - Call Processing mode
      - Setup Call Processing Parameter screen (Call Processing Test Condition Set screen)
      - Sequence Monitor screen (Call Processing Operation Sequence Display screen)

- Recall mode
  - Recall Parameter screen
    (Screen for recalling parameter-file/template-file/pattern-file)
- Save mode
  - Save Parameter screen
    (Screen for saving parameter-file/template-file/pattern-file)
- File Operation mode
  - File Operation screen
    (Screen for file retrieval/deletion/protection-setup in FD, and FD initialization)
- Change System mode
  - Change System screen
    (Screen for changing TX&RX Tester mode measurement system)
- Instrument Setup mode
  - Instrument Setup screen
    (Screen for setting up RS232C/GPIB, etc. for MT8802A main frame)

Note: Change Color mode (Selection for screen display color) is setup using the function key menu. There is no screen in Change Color mode.

SECTION 4
OPERATION

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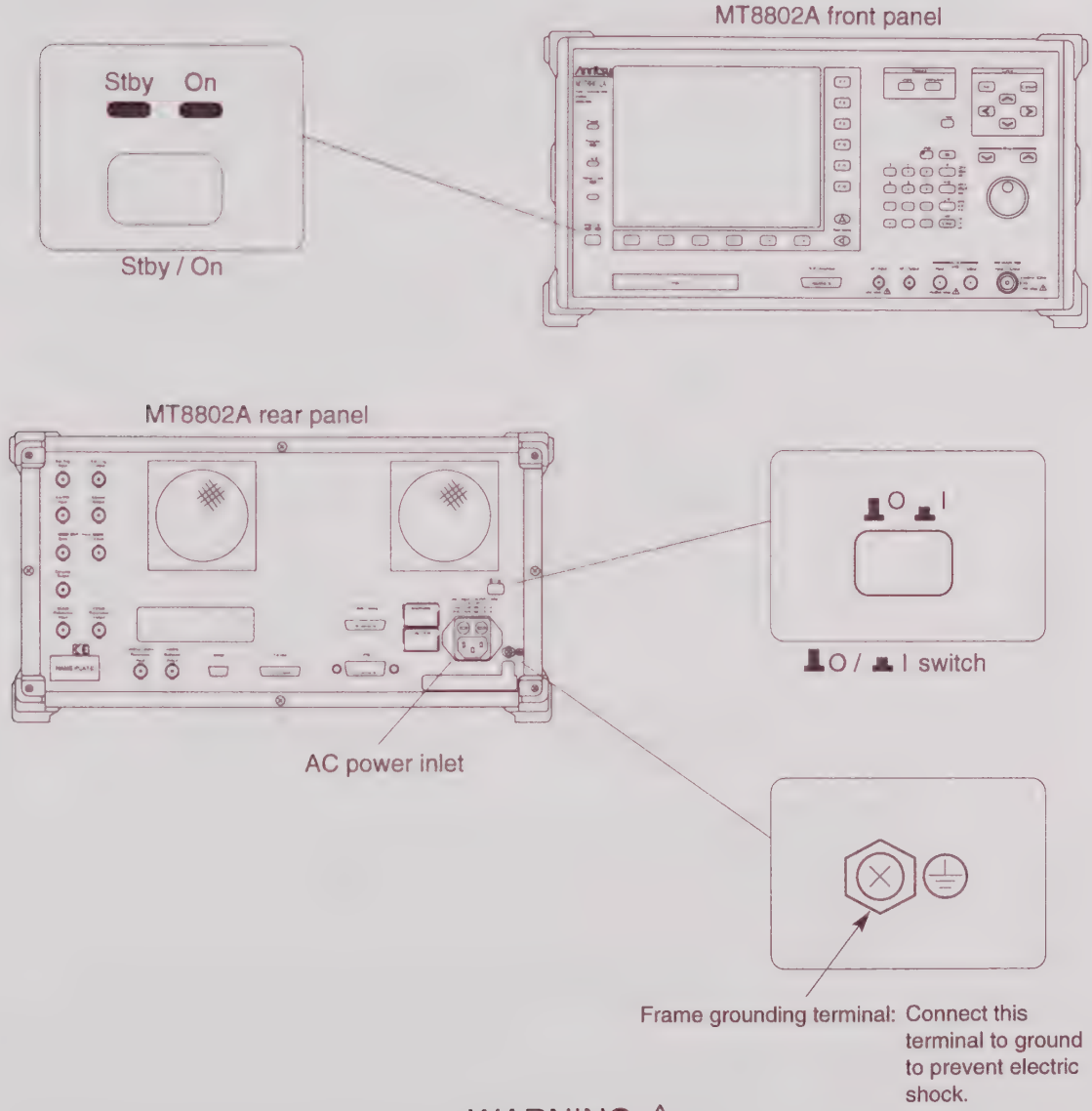
4.1 Turning on and off the Power

The MT8802A has two power switches: The Stby/On switch on the front panel and O/I (main power) switch on the rear panel.



WARNING ⚠

• Protective grounding

If the power is turned on without protective grounding, operator runs the risk of electric shock. If the MT8802A does not have a three-pole (grounding type two-pole) power outlet, be sure to connect the frame grounding (FG) terminal on the rear panel or ground terminal of the accessory power cable to ground before turning on the MT8802A power.

CAUTION ⚠

• Checking the power supply voltage

If the AC power supply voltage is improper, abnormal voltage may damage the mechanism inside the equipment. Confirm that the AC power supply voltage is within the specified rating before turning on the MT8802A power.

The following shows the specified power supply voltage and frequency:

Voltage: 85 to 132 Vac or 170 to 250 Vac (Because an automatic input voltage rating switching system is used, the rating need not be switched.)

Frequency: 47 to 63 Hz

For normal MT8802A operation, leave the power switch on the rear panel set to on when the AC power inlet is connected to the power outlet, and only use the Stby/On switch on the front panel to turn the power on and off.

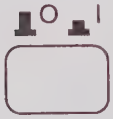
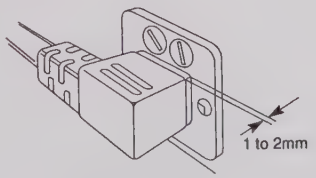
Check the power display lamps at the lower-left part of the front panel as listed in the table below to confirm the power supply state.

Table 4-1 Power Display Lamp Indications and Power Supply States

Display lamp / State	Power standby display lamp (green) (Stby)	Power on display lamp (orange) (On)
Main power off	Off	Off
Only main power on	On	Off
All power supplies on	Off	On

4.1.1 Turning on the Power

Perform the power-on procedure through warming up the internal reference oscillator to normal MT8802A operation in order of the following steps:

Step	Operation	Description
1.	Connect the frame grounding terminal on the rear panel to ground.	• When using a three-pole power cable with a grounding terminal, the MT8802A need not be grounded.
2.	 Set the O I switch on the rear panel to O (Off).	• When the button is pressed down and set, it is I (On). Press the button again to release it. When the button is set Off, the AC power is turned off even if the power switch on the front panel is set On.
3.	Connect the power cable jack to the AC power inlet on the rear panel.	• Fully insert the power cable jack so that there is a gap of 1 to 2 mm as shown in the figure below.
4.	Connect the power cable plug to the AC power outlet.	

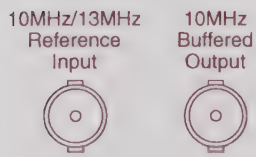
Step	Operation	Description
5.	Set the O I switch on the rear panel to I (On)	• The Stby lamp on the front panel power switch lights. • The reference crystal oscillator circuit built in the MT8802A starts to warmed up. Before operating the MT8802A under low temperatures, warm up the crystal oscillator for 24 hours. The table below lists the stability of the crystal oscillator based on the warm-up time.
6.	Hold down the Stby/On switch on the front panel for a few seconds to set it On.	• The On lamp on the front panel power switch lights and the Stby lamp goes off. • Power is supplied to all circuits in the MT8802A, then the MT8802A becomes operable.

Crystal oscillator stability

Item		Stability
Starting characteristics	After 30-minute operation	5 x 10^{-8}/day or less
Aging rate (after 24-hour operation)		2 x 10^{-8}/day or less
Stability at ambient temperature change of crystal oscillator (25°C ±25°C)		±5 x 10^{-8} or less

Notes: If neither power display lamp lights, check the following:

1. Are the power cables properly connected to the power inlet and power plug?
2. Are the specified fuses set in the fuse holders?
3. Is the power supply voltage correct?



Notes: The left figure shows the reference signal input/output connectors on the MT8802A rear panel. The internal 10 MHz reference signal is output from the 10 MHz OUTPUT connector at TTL level. When the internal reference signal is not used, input an external reference signal satisfying the following conditions to the 10 MHz/13 MHz Reference Input connector:

i) Frequency: 10 MHz ±1 ppm, signal level: 2 to 5 Vp-p

ii) Frequency: 13 MHz ±1 ppm, signal level: 2 to 5 Vp-p

Set the reference frequency on the Instrument Setup screen (see paragraph 4.3.1) according to the external reference signal used as described in i) and ii) above.

Warm up the external reference signal equipment separately from warming up the MT8802A.

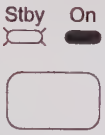
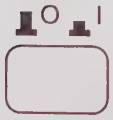
4.1.2 Turning off the Power

Turn off the power as described below.

(1) Normal power-off procedures

Step	Operation	Result check
1.	Press the Stby/On switch on the front panel for a few seconds to set it to Stby state.	• The On lamp of the Power switch on the front panel goes off, and the Stby lamp lights. • Only the internal reference crystal oscillator is turned on.

(2) Power-off procedures for storage or long stop

Step	Operation	Result check
1.	Press the Stby/On switch on the front panel for a few seconds to set it to Stby state.	• The On lamp of the power switch on the front panel goes off and the Stby lamp lights. • Only the internal reference crystal oscillator is turned on. 
2.	 Set the O I switch on the rear panel to the I (off) position.	• The AC power is turned off. Both the Stby and On lamps of the Power switch on the front panel go off. • Only the internal reference crystal oscillator is turned on.

4.1.3 Setup state after power-on

- The Setup Common Parameter screen is displayed shortly after power-on. At this time, parameters can be set by specifying Power-On Initial on the Instrument Setup screen.(See paragraph 4.3.3.)
- If a short power failure occurs, the power switch on the front panel goes Off. In this case, press the power switch On again.

4.2 Screen Descriptions

This paragraph describes the common items displayed on the screen.

(1) Screen layout

The composition of the measurement screen is described below.

- Title display area
  The type MT8802A, and date (**_**_**) time (**:**:**), or user-defined character string (title) are displayed on the top left line. These are set on the Instrument Setup Screen.
- Screen name display area
  The screen name (paragraph 3.2.2 (4)) and measurement system name are displayed on the second line from the top left.
- Measurement error messages display area
  Messages for errors generated during measurement are reverse displayed on the third line from the top left.
  There are 8 measurement error messages as follows. TX messages are shown in high priority order.

  [TX measurement]

Priority		
High	Input Level Over	RF input level exceeded the hardware limit.
▲	Level Over	Level too high
▼	Level Under	Level too low
	Signal Abnormal	Measurements cannot be carried out.
Low	Unique Word Not Found	Sync word cannot be detected

  [RX measurement]

Pattern Sync Being Established	
Pattern Sync Loss	
Over Flow	Mesured data is over flowed.

- RF input/output display
  "M" or "A" displayed on the first line from the top center indicates the RF connector used.
  M: Main Input/Output
  A: AUX Input/Output
- Calibrated display
  If the MT8802A is already calibrated, "C" is displayed on the second line from the top center.
  This is appeared after executing calibration on the Modulation Analysis screen etc..
  C: Calibrated
- User calibration factor setting display
  If a user calibration coefficient is being set, "U" is displayed on the third line from the top center.
  This is appeared when the user Cal. factor is set to on at the TX Measure Parameter Screen and RX Measure Parameter screen.
  U: User Cal. Factor

- Measurement mode display area

  The measurement mode is displayed on the first line from the top center.

  This is appeared depending on the Measure key (Continuous/Single).

  Measure: Continuous: Continuous measurement

  Measure: Single: Single (one time) measurement

  In average storage mode, nothing is displayed in this area.

- Storage mode display area

  The displayed value or waveform storage mode is displayed on the second line from the top right.

  This is the setting value of the storage mode on the current measurement screen.

  Storage:

  Normal: Normal display

  Overwrite: Trace data overwriting

  Average : Averaging

  (order of storage operations performed and total number of operations)

  Wide: Wide dynamic range

  Max Hold: Maximum value held

  Min Hold: Minimum value held

  Cumulative: Dot data accumulation display

- Measurement method display area

  The Call Processing state(Call Proc) , measurement method(Method) and waveform format(Trace) are displayed on the third line from the top right.

  Call Processing state: When the DUT Control is set to Call Proc to make Call Processing mode,the current Call Processing state is displayed.

  Stop: Call Processing function stops.

  Idle: Idle state. The MT8802A generates downlink CCH signal, and waits the uplink CCH signal from the DUT(MS:Mobile Station).

  Registration: Sequence execution state for location registration.

  Origination: Sequence execution state for origination.
  This is the transition state from Idle to Communication, and is triggeredfrom DUT.

  Termination: Sequence execution state for termination.
  This is the transition state from Idle to Communication, and is triggeredby pressing [Termination]F2 key on MT8802A.

  Communication: Communication state on TCH.

  Disc from MS: Sequence execution state for disconnection from MS.
  This is the transition state from Communication to Idle, and is triggeredfrom DUT.

  Disc from NW: Sequence execution state for disconnection from Network (i.e.MT8802A).
  This is the transition state from Communication to Idle, and is triggeredby pressing [Disc from NW]F2 key on MT8802A.

  Hand Over: Sequence execution state for handover.
  This is the transition state between TCHs of different frequency or slot.

Method: This is set by "Method" on the Occupied BW screen and Adjacent Channel Power screen.

Spectrum	Measurement by spectrum analyzer
Spectrum(All)	Measurement by spectrum analyzer (one time measurement method: 5 channels/time for adjacent channel leakage power measurement)
Spectrum (Separate)	Measurement spectrum analyzer (separated measurement method: 1 channel/time for adjacent channel leakage power measurement)
High Speed	High-speed measurement by digital signal processing

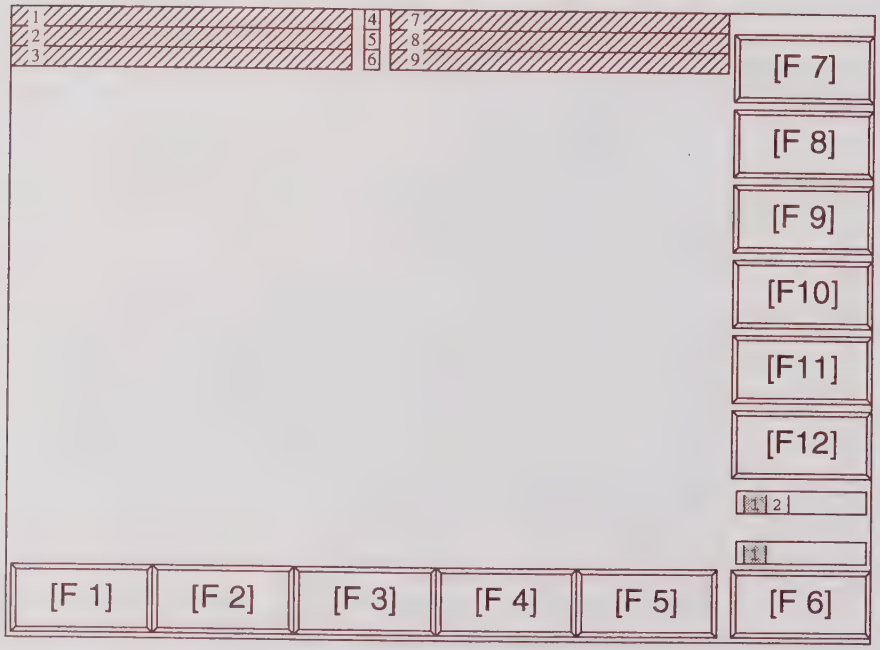
Trace: This is set when the waveform display mode of the Modulation Analysis screen is set.

- Constellation
- Eye Diagram
- Vector Error
- Phase Error
- Magnitude Error

• Menu display area

The titles of up to six main function keys (F1 to F6) are displayed horizontally along the bottom.
When the [Main Menu on off] (F6) key on the right is set On, the main function menu is displayed.
When the [Main Menu on off] (F6) key is set Off, the menu is displayed according to the screen contents.
Use the Next Menu [◀] key to display the next page.
The display of 1 (first page), 2 (second page), or later above the F6 menu indicates the current page.

The titles of up to six function keys (F7 to F12) are displayed vertically along the right side.
The display of 1 (first page), 2 (second page), or later under function key F12 indicates the menu page number.
The current page is reverse displayed. If there are multiple pages, use the Next Menu [▲] key to display the next page under the F12 key.



1. Title/date and time
2. Screen name
3. Measurement error or measurement being performed
4. RF input switching
5. Calibrated display
6. User Cal display
7. Measurement mode
8. Storage mode
9. Measurement method and trace format

Fig. 4-1 Screen Layout

(2) Function keys

The symbols displayed on the top right of the function keys indicate the following functions:

*: Indicates a lower level function key is displayed when this function key is pressed.

->: Indicates the screen is changed by pressing this function key.

#: Indicates a window is opened to set a value using the ten-keypad, Step key, or rotary knob when this function key is pressed.

(a) Menu for transition to lower hierarchy screen
(The Back screen key switches the current screen to the higher hierarchy screen.)

(b) Menu for transition to lower hierarchy menu

(c) Menu for opening the value setting window

• Function key menu that select setting item:

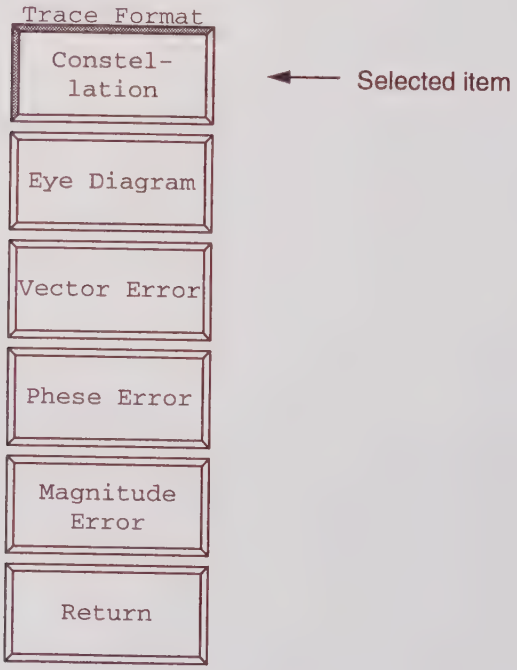
One of the multiple selection keys (displayed in the same menu hierarchy) can be selected. The top and right frames of the selected key are reverse displayed. (See para. (e) below.)

The setting values displayed in a key are changed alternately. When such a key is selected, the set value is reverse displayed. (See para. (d) below.)

(d) Menu on which set items are switched alternately (alternate key menu)

(e) Menu on which a set item is selected

[Example of the function key menu]



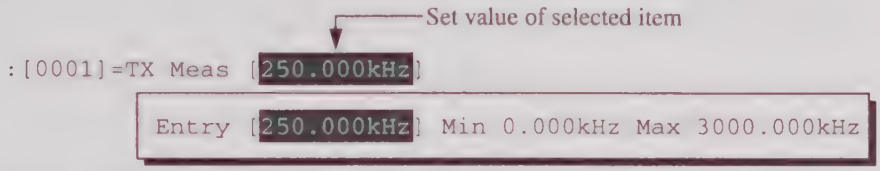
[Example of the main function key menu]

(3) Entering the data

(a) Entering numeric data by opening/closing the window

(i) Entering numeric data by moving the cursor and opening/closing the window

Move the cursor to the brackets enclosing the item to be set, then press the Set key. The value setting window shown below is opened and numeric data can be set.

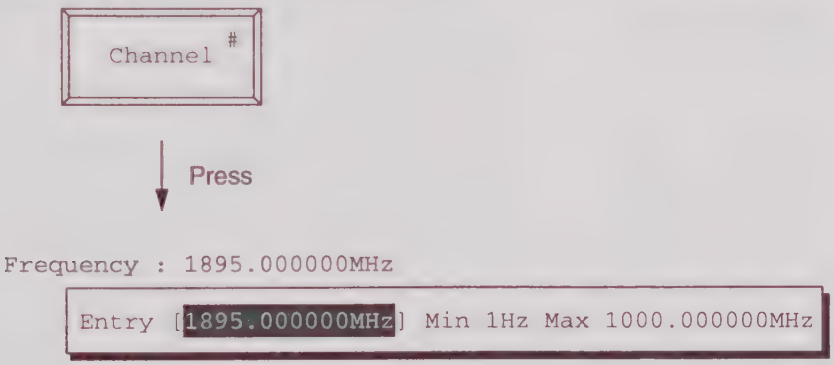


When a value is entered using the ten-keypad, Step key, or encoder, then press the unit or Set key, the numeric data is defined and the window is closed

If the Cancel key, a function key or main function key is pressed while the window is open, the window is closed and the previously set value is displayed.

(ii) Entering numeric data by pressing a function key or main function key

When the key marked # on the top right of the menu is pressed, the value setting window shown below is opened and numeric data can be set.



When a value is entered using the ten-key pad, Step key, or encoder, then press the unit or Set key, the numeric data is defined and the window is closed.

If the Cancel key, a function key or main function key is pressed while the window is open, the window is closed and the previously set value is displayed.

(b) Entering selection item by opening/closing the window

Move the cursor to the brackets enclosing the item to be set, then press the Set key. The selected item setting window shown below is opened and the selected item can be set.

When an item in the window is selected using the cursor keys and the Set key is pressed, the set value is defined and the window is closed.

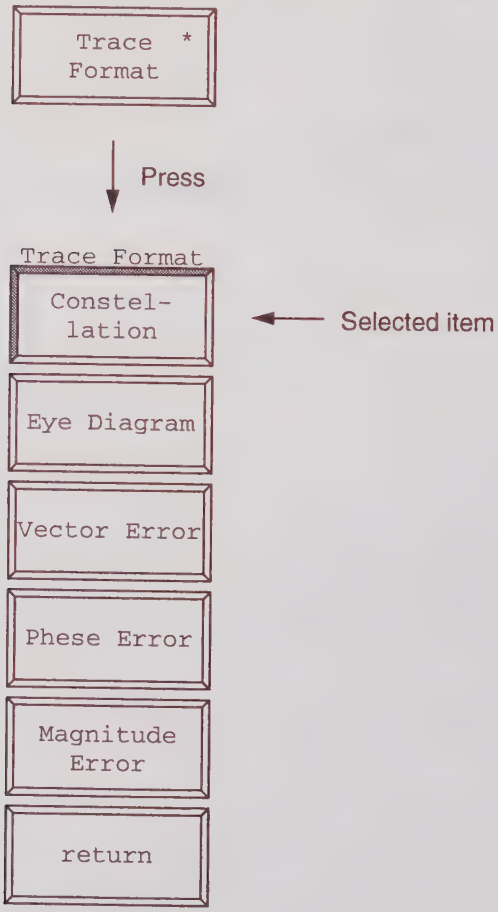
(c) Entering selected items using alternate keys

Selection items are displayed on the function key menu. Each time one of these keys is pressed, set values are switched alternately. The currently selected item is reverse displayed.

(d) Entering selected items using function keys with lower hierarchy

When the key marked * on the top right of the menu is pressed, the menu set of the lower hierarchy shown below is displayed.

Select an item from the menu set and press the corresponding function key. The menu display of the selected item is changed. When the return function key is pressed, display returns to the menu set of the higher hierarchy.



(e) Entering the title

See paragraph 4.3.3, "Instrument Setup screen."

4.3 PDC Transmitter and Receiver Test: TX and RX Tester Mode

This paragraph describes operation when using the MT8802A in which measurement software (MX880216A) is installed to measure the PDC transmitter and receiver.

4.3.1 Preparations

This paragraph describes the setup, zero-point calibration of the power meter, and RF cable loss correction when measuring the DUT.

(1) Setup

This following explains how to set the MT8802A and device under test (DUT) when conducting transmitter (TX) and receiver (RX) tests.

(a) Setting the transmitter (Tx Measure)

There are two connection modes depending on the transmission level ranges of the device under test:

(i) Condition: output level of the transmitter: +10 to 40 dBm

Setup:

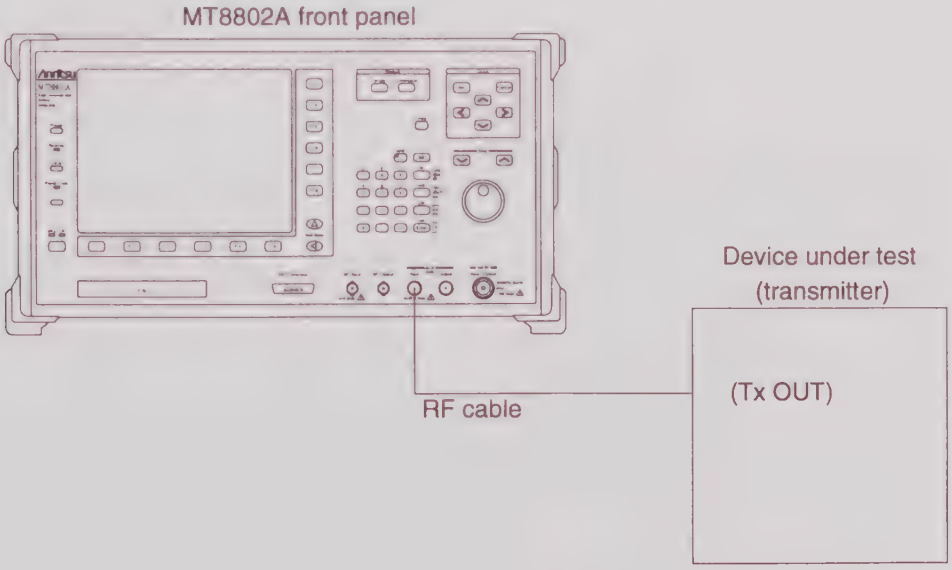


Fig. 4-2 (No.1)

(ii) Condition: Output level of the transmitter: -30 to +5 dBm

Setup:

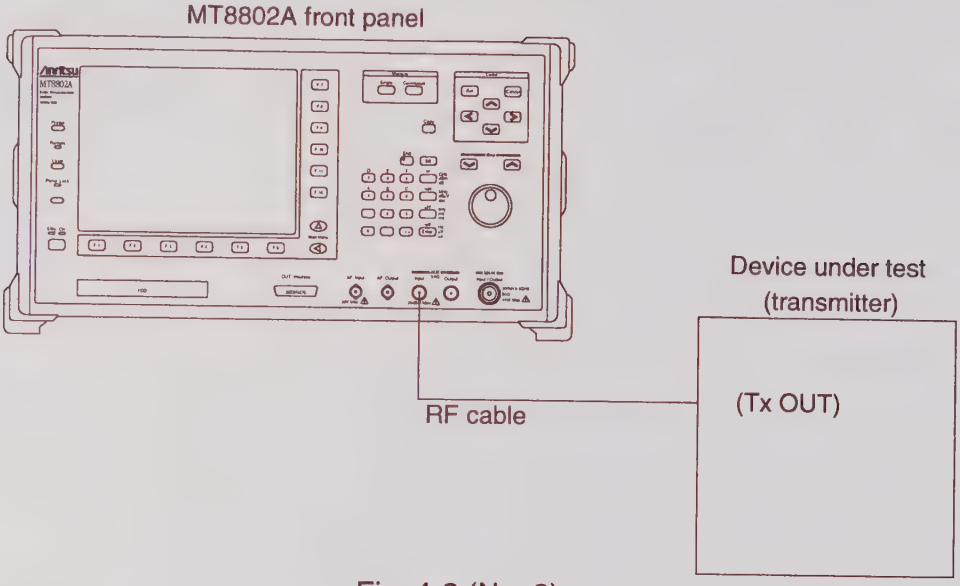


Fig. 4-2 (No. 2)

Note 1: When measurement is performed using the Main Input/Output connector, highly accurate measurement is enabled by absolute value calibration using the power meter built in the MT8802A at RF Power measurement.

Note 2: The RF receiving sensitivity can be increased for measurement by using the AUX Input connector.
The lowest level of the signal input to the AUX Input connector (-30 dBm) is 25 dB below that of the Main Input/Output connector (-5 dBm).

Note 3: The AUX connector is a TNC connector. If the standard accessory of the MT8802A is used, also use the coaxial adapter (N-J · TNC-P) and coaxial cable.

CAUTION ⚠

• The maximum input level of the AUX Input connector
The maximum input level of the AUX Input connector is +20 dBm. If a signal whose level exceeds the specified value is input, the internal circuit of the MT8802A may be damaged.

• AUX Output connector
The AUX Output connector is the dedicated output connector of the signal generator in the MT8802A. If a transmitter signal is input in the AUX Output connector, the internal circuit may be damaged.

[DUT Interface connector]

The DUT Interface connector is equipped on the bottom of the MT8802A front panel to receive signals for control and measurement.

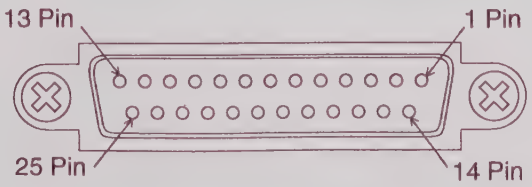
The following lists the specifications and functions of the DUT connector and gives and notes on its use.

1) Specifications of the DUT Interface connector

The DUT Interface connector is a 25-pin female D-SUB connector.

Signal assignmen

Pin number	Signal name	Signal type	Specification	Direction
1	GND	Signal ground		– – –
2	DUT_TXD12	Spare output	12 V level	MT8802A -> DUT
3	DUT_RXD	Spare input	5V TTL / 3V C-MOS / 12V	MT8802A <- DUT
4	DUT_RTS12	Spare output	12 V level	MT8802A -> DUT
5	DUT_CTS	Spare input	5V TTL / 3V C-MOS / 12V	MT8802A <- DUT
6	AF_SHELL	Spare output (balanced output -)		MT8802A -> DUT
7	GND	Signal ground		– – –
8	DUT_RTS5	Spare output	5 V TTL level	MT8802A -> DUT
9	DUT_IN0	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
10	DUT_IN1	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
11	DUT_IN2	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
12	DUT_IN3	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
13	PRSS_TLK0	Press talk switch 0	Current capacity: 0.5 A or less	MT8802A -> DUT
14	DUT_OUT0	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
15	DUT_OUT1	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
16	DUT_OUT2	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
17	DUT_OUT3	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
18	AF_SIGNAL	Spare output (balanced output +)		MT8802A -> DUT
19	DUT_TXD5	Spare output	5 V TTL level	MT8802A -> DUT
20	12VOUT	+12 V power output	12 V, 50 mA or less	MT8802A -> DUT
21	BCLK_IN	BER measurement clock	5 V TTL/3 V C-MOS level	MT8802A <- DUT
22	BDAT_INBER	Measurement data	5 V TTL/3 V C-MOS level	MT8802A <- DUT
23	DUT_TXD3	Spare output	3 V C-MOS level	MT8802A -> DUT
24	DUT_RTS3	Spare output	3 V C-MOS level	MT8802A -> DUT
25	PRSS_TLK1	Press talk switch 1	Current capacity: 0.5 A or less	MT8802A -> DUT



2) Pin descriptions

2.1) Signal ground (GND)

This signal ground is the common grounding terminal of all signals using this connector.

2.2) 12 V power output

The 12 V power output can be used for the DUT or external interface for the DUT.
The maximum current capacity of this output is 50 mA.

2.3) BER measurement signal

The BER measurement signal is applied to this terminal to receive the data output from the DUT when measuring receiving sensitivity.
A serial signal is assumed to be output from the DUT. Input both serial data and the transmission clock for serial data.
The level of the input signal is 5V TTL or 3V C-MOS level.

2.4) Press talk switch

The press talk switch is a control terminal for the transmission On/Off switch used mainly for analog radio.
Because the MT8802A (PDC TX/RX measurement or PHS TX/RX measurement) does not use this terminal, leave it unconnected.

2.5) Spare input and output

Spare input and output are terminals provided for future expansion. The MT8802A (PDC or PHS TX/RX measurement) does not support these terminals. Leave these terminals unconnected.

Note: Do not input BER measurement signals of BER Input (Data/Clock) and the DUT Interface at the same time.
In the MT8802A, these signals are logically producted to generate the BER measurement signal. Therefore, if a Low level signal is applied to a terminal which is not input for BER measurement, the BER measurement signal is set to All 0 in the MT8802A and measurement is disabled.

(b) Receiver test (RX Measure) setup

Send the RF test signal from the MT8802A to the DUT, input the receiver (DUT) result to the MT8802A, then measure the bit error rate (BER).

• The receiver (DUT) result can be returned from the DUT to the MT8802A in either of the following 2 ways:

1. Send the demodulation data of the DUT to the DUT Interface connector (front panel) as a digital signal.
2. Send the demodulation data of the DUT to the BER Input connectors (Data/Clock on the rear panel) as a digital signal.

• When conducting the receiver test, set the MT8802A in either of the following 2 ways:

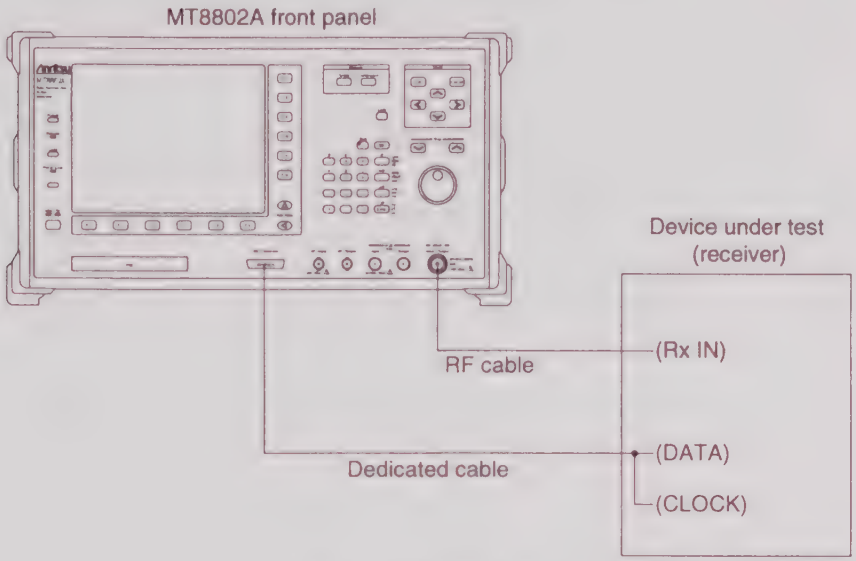


Fig. 4-3 (Setup No.1)

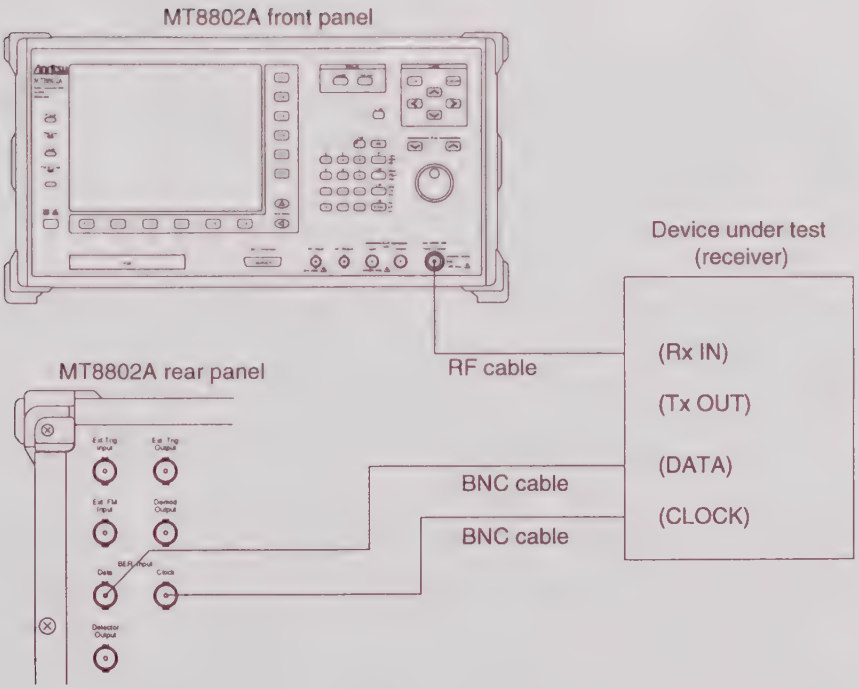


Fig. 4-3 (Setup No.2)

Note: Levels of RF signal output from the MT8802A are as follows:
Main: -143 to -28 dBm
AUX Output: -143 to -3 dBm: The maximum level is 25 dB higher than that of the Main connector.

(c) Setup for the call-processing test (Call Processing).

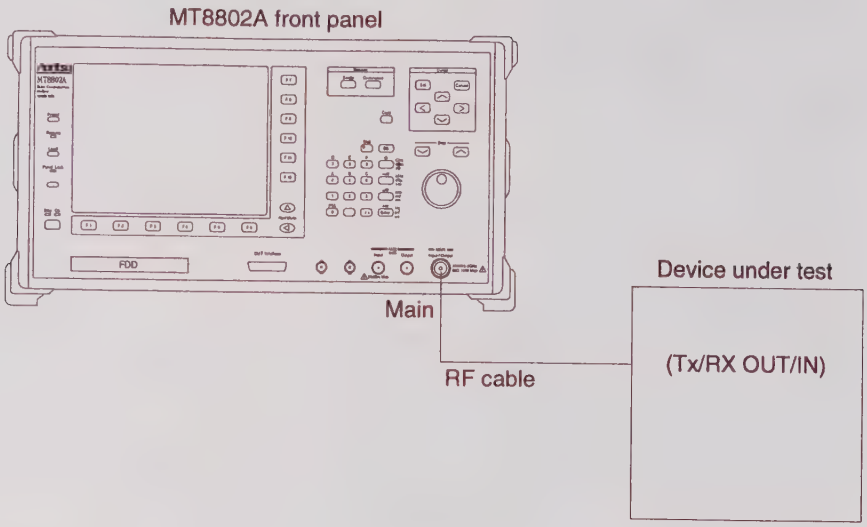


Fig. 4-4 Setup

CAUTION ⚠

- AUX Output connector

The AUX Output connector is the dedicated output connector of the signal generator in the MT8802A. If a transmitter (DUT) signal is input in the AUX Output connector, the internal circuit may be damaged.

- About switching the RF measurement connector

The MT8802A has the Main Input/Output, AUX Input, and AUX Output connectors for measuring RF signal. The MT8802A selects and uses any one of them. (The used connector is selected by the RF Input/Output on the Instrument Setup screen, and [TX Measure]F1/[RX Measure]F2 function keys.)
Use the selected connector for measurement.
Note that when the Main Input/Output connector is used for RX measurement, the signal to be measured may leak to the AUX Output connector.

(2) Calibration before measurement

The MT8802A has two types of power measurement functions.
For high precision measurements, calibrate the MT8802A as shown below.

(a) Power meter function

Press the [Power Meter] F12 key in TX/RX Tester mode to set the power meter function.
The power meter function uses a thermo-couple to measure the average power with high precision.
Calibrate the MT8802A at the zero power point for high-precision measurements.

Zero-point calibration: Disconnect anything from the Main Input/Output connector to set no input power, and press the [Zero Set] F11 key to automatically calibrate the power meter at the zero power point.

For details on operation, see Paragraph 4.3.6, (7) "Power Meter."

Note: The power meter function is effective only when the Main connector is used.

(b) Burst-power measurement function

Press the [RF Power] F9 key in TX/RX Tester mode to set the burst-power measurement function.
This function measures the on/off power, rise/fall times etc. of burst signals. For high precision measurement, internal calibration is required.
There are two types of internal calibrations of the Adjust Range and Manual Calibration, as described below.

Adjust Range:	Optimizes the internal RF ATT, A/D input level, and power meter range of the MT8802A for the signal to be measured. This function can increase the measurement range for the on/off ratio and adjacent channel leak power.
Manual Calibration:	Calibrates the measured power value in the RF Power screen using the MT8802A built-in power meter. Pressing the Calibration Cancel key clears the calibration factor to 0 dB. The calibration factor may become incorrect when the internal temperature rises, the ambient temperature changes, the measurement frequency changes etc.. For precise measurement of the TX power, perform Manual Calibration at that time.

For details on operation, see Paragraph 4.3.6 "Transmitter Test."

Notes:

1. Manual Calibration is effective only when the Main connector is used.
2. The Adjust Range and Manual Calibration run a common internal process in all TX measurement screens.
   Once calibration is performed in any TX measurement screen, no more calibration is required in any other screen.
3. If the MT8802A input level is small or the input frequency does not match the setup frequency, the Adjust Range and Manual Calibration may not be performed properly.
4. Execute Adjust Range and Manual Calibration while the measurement signals are input stationary.
5. Performing Manual Calibration results in an error (corrected data cannot be generated), and calibration factor of the Manual Calibration (held before the execution) is lost.

(3) Correcting RF cable loss when conducting the transmitter test (TX Measure mode): Setting User Cal Factor

When conducting the transmitter test (TX Measure mode), set the loss of the RF cable connecting the MT8802A and transmitter under test as a correction value (User Cal Factor) to measure RF power in the transmitter under test.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1 Next Menu [▲] [Setup TX Parameter]F7	Displays the first page of the TX Measure menu. Displays the second page of the TX Measure menu. Displays the Setup TX Measure Parameter screen.
4.	Cursor [∧] [∨]	Moves the cursor to User Cal Factor.
5.	[Set][-/+] [0] [1] to [F/9] [BS]	Enter the RF cable loss. Example: For 5dB loss, enter 5.00 dB.
6.	[Enter]	Defines the entered value.
7.	[Back Screen]F12	Returns to the Setup Common Parameter screen.

(4) Correcting RF cable loss when conducting the receiver test (RX Measure mode): Setting Offset Value

When conducting the receiver test (RX Measure mode), use the loss of the RF cable connecting the MT8802A and receiver under test as a correction value (Offset Value) to measure RF power in the receiver under test as follows.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[RX Measure]F2 [Bit Error Rate]F7	Displays the RX Measure menu. Displays the Bit Error Rate screen.
4.	[Level]F3 Next Menu [▲]	Displays the first page of the Level menu. Displays the second page of the Level menu.
5.	[Offset Value]F7	Opens the Offset Value window.
6.	[-/+] [0] [1] to[F/9] [Shift/o] [BS]	Enter the RF cable loss. Example: For 5 dB loss, enter -5.00 dB.
7.	[Enter]	Defines the entered value.
8.	[Offset On Off]F8	Sets Offset On. Offset is displayed in the RF output level display field.
9.	[Back Screen]F12	Returns to the Setup Common Parameter screen.

4.3.2 Selecting and changing the measurement system: Change System screen

Change the measurement system according to the following steps.
For measurement after change, refer to the manual of the selected measurement system.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Func Menu on. The Main Menu appears at the bottom of the screen.
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[Change System]F1	Sets Change System mode. The Change System screen and System menu appear.

This screen is used to select anyone of measuring systems and to upgrade the system software.

Note: Changing any measuring system in this screen initializes the corresponding measurement parameters. Save the parameters before changing if necessary.

(1) Changing the built-in measuring system

This paragraph describes how to exchange the measuring system used when more than one measuring systems are built in the MT8802A.

Step	Key operation	Description
1.		Make sure that "Current System" shows the system currently selected and that "Application Memory" contains a new measuring system to select.
2.	[Change System]F7	Sets Change System mode. Displays one of the measuring system softwares in the "Application Memory" in reverse display.
3.	Cursor [∧] [∨]	Select one of the measuring system softwares in the "Application Memory".
4.	Set	Confirms the measuring system software.

(2) Loading measuring systems from an external floppy disk

This paragrsph describes how to load measuring systems from an external floppy disk.
(This function is effective only when the measuring software floppy disk is used.)

Step	Key operation	Description
1.		Set the floppy disk containing measuring system files in the floppy disk driver of the MT8802A.
2.	[Floppy Disk Dir]F8	Displays measuring system files on the floppy disk. Here, confirm the "Unused area" under "Application Memory", and also the size of the measuring systems on the floppy disk. The measuring systems can be loaded when the value in "Unused area" is greater than size of measuring systems to be loaded.
3.	[Install system form FD]F10	Loads measuring system from the floppy disk to "Application Memory."
4.	Set	Make sure that the measuring systems are displayed(saved) in "Application Memory."

4.3.3 Setting the measurement system conditions: Instrument Setup screen

Set the standard frequency of the measurement system (10 MHz or 13 MHz), RF connector (Main or AUX), screen title/ date/time display, interface (GPIB or RS232C), printer (ESC/P), and alarm (on or off) on this screen.

Procedure for transition to the Instrument Setup screen

Step	Key operation	Description
1.	[Main Func on off]F6	Set Main Func on. The Main Menu appears at the bottom of the screen.
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[Instrument Setup]F2	Sets Instrument Setup mode. The Instrument Setup screen appears. The Instrument Setup function key menu appears on F7 to F12.

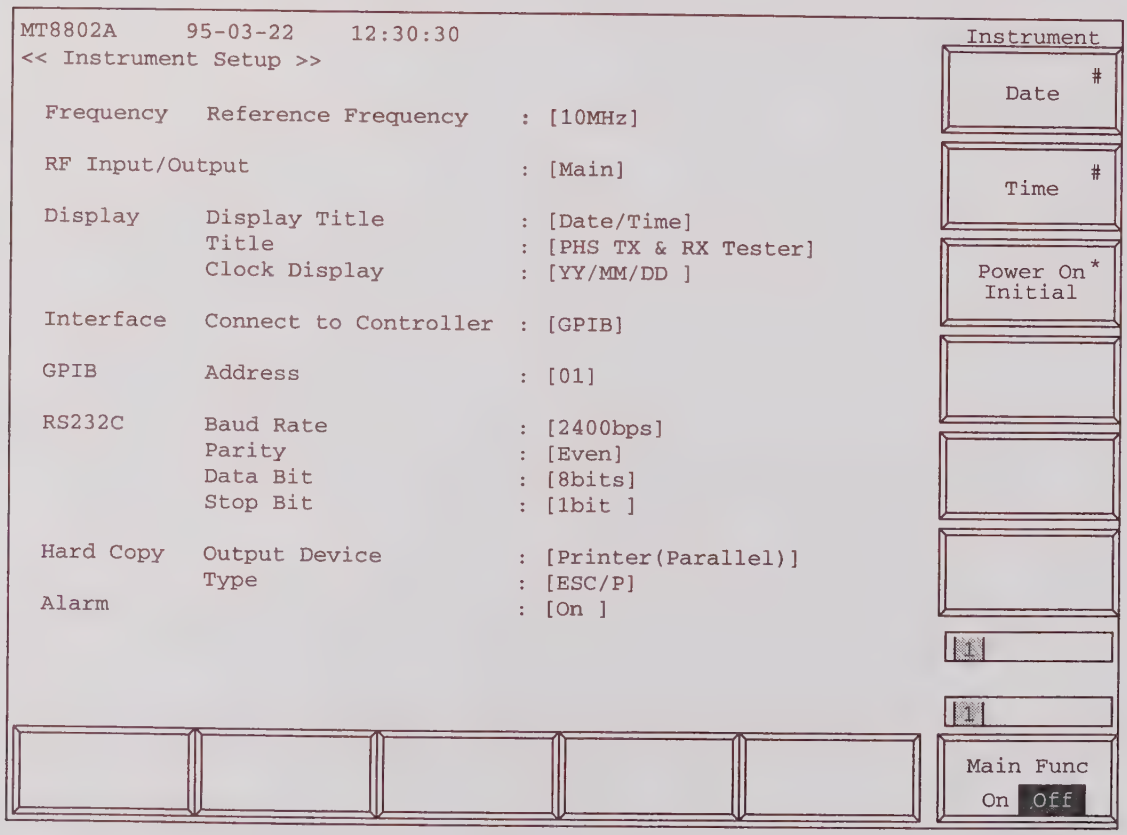


Fig. 4-5 Instrument Setup Screen

• Set the following items:

Item	Range	Initial value
Frequency		
Reference Frequency		
	10MHz, 13MHz	10MHz
RF Input/Output	Main, AUX	Main
Display		
Display Title		
	User Define, Date/Time, Off	User Define
Title	User Define, Date/Time, Off	
	(32 alphanumeric characters) (*1)	
Clock Display		
	YY/MM/DD (year, month, day)	
	MMM-DD-YY (month, day, year)	
	DD-MMM-YY (day, month, year)	YY/MM/DD (year, month, day)
Interface		
Connect to Controller		
	GPIB, RS232C	GPIB
GPIB		
Address	00 to 30	01
RS232C		
Baud Rate	1200, 2400, 4600, 9600(bps)	2400
Parity	Even, Odd, Off	Even
Data Bit	7 bits, 8 bits	8 bits
Stop Bit	1 bit, 2 bits	1 bit
Hard Copy		
Output device	Printer (Parallel), File	Printer (Parallel)
Type	ESC/P, HP2225... for Printer (Parallel)	ESC/P
	BMP (B&W)... for File	
Alarm	On, Off	On

*1 Entering the title:
A title up to 32 characters can be entered in the title display area. (User Define)
MT8802A**_**_**(date)**:**:**(time) is displayed as an initial value. (Date/Time)
Enter a title according to the following steps. (User Define)

Step	Key operation	Description
1.	Cursor [∧] [∨]	Moves the cursor to the Title entry area.
2.	[Set]	Opens the Tile entry window.
3.	Step [∧] [∨]	Moves the cursor into position in the Title entry area to enter character.
4.	Cursor [<] [>]	Select a character.
5.	[Enter]	Defines the character.
6.	[BS]	Correct any incorrect character.
7.		Repeat steps 3 to 6 to enter all characters in the Title entry area.
8.	[Set]	Defines the entered character string.

- Function keys

Main function key: None

Function keys:

[Date]F7: Opens the date entry window.

[Time]F8: Opens the time entry window.

[Power On Initial]F9: Displays the Power On menu to select Initialization modes, which are classified into Previous Status and Recall File.

Initial value: Previous Status

When Previous Status mode is selected, the parameters after power-on retain the status held before the previous power-off.

When Recall File mode is selected, the parameters after power-on are set by reading the specified file.

[Previous Status]F7 Sets the parameters after power-on to the status held before the previous power-off.

[Recall File]F8 Accesses the floppy disk to call the parameter file list.

[File No.]F9 Opens the parameter-file setting-location (number) entry window.

File No.: 0 to 99, Initial value: 0

[return]F12 Returns to the previous menu.

• Selecting Power On Initial mode

The following describes how to select parameter initialization mode after power-on.

1. Selecting Previous Status mode

Step	Operation
1.	Press the [Power On Initial] (F9) key.
2.	Press the [Previous Status] (F7) key.
3.	Press the [return] (F12) key to define the parameters then return to the previous menu.

2. Selecting Recall File mode (being developed)

Step	Operation
1.	Press the [Power On Initial] (F9) key.
2.	Set the floppy disk (on which parameters to be read before power-on are written) in the floppy disk drive.
3.	Press the [Recall File] (F8) key. (Access the floppy disk to call the parameter list file.)
4.	Display the parameter file to be set on the screen.
5.	Press the [File No.] (F9) key. (Open the parameter-file setting-location [number] window.)
6.	Enter the number of the parameter file to be set.
7.	Press the [Set] key to define the parameters, then press the [return] (F12) key to return to the previous menu.

Notes:
- If no floppy disk is set before power-on or a floppy disk other than that used at setting is used, parameters may be set in Previous Status mode or different parameters may be set.
- The ambient temperature range of the floppy disk is specified as 5 to 45 ˚C. If a set temperature is outside the specified range, operation is not guaranteed.

- Changing the time and date of the built-in clock

1. Changing the date

Step	Key operation	Description
1.	[Date]F7	Opens the date setting window. Displays the current date and time of the built-in clock.
2.	Cursor [∧] [∨]	Moves the cursor to the part to be changed.
3.	[Set]	Opens the setting window.
4.	0 to 9, [BS]	Sets the data.
5.	[Set]	Closes the setting window and establishes the set value.

2. Changing the time

Step	Key operation	Description
1.	[Date]F7	Opens the time setting window. Displays the current time of the built-in clock.
2.	Cursor [∧] [∨]	Moves the cursor to the part to be changed.
3.	[Set]	Opens the setting window.
4.	0 to 9, [BS]	Sets the data.
5.	[Set]	Closes the setting window and establishes the set value.

Note: To stop changing the date or time of the built-in clock

To stop changing the date or time after opening the setting window of the built-in clock, press the [Cancel] key in the above Step 4 or 5 (do not use the [Set] key). If the [Set] key is pressed again after the date and time window is opened, the value on the setting window is set again. The date and time window remains in the state when the window was opened. Therefore, if the [Set] key is pressed without changing the display on the window, the date and time of the built-in clock are delayed.

4.3.4 Setting the screen display color: Change Color menu

To set a screen color, display the Change Color menu as follows.

(The F7 to F12 function keys menu changes to the Change Color menu, but the screen does not change.)

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on. The Main Menu appears at the bottom of the screen.
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[Change Color]F3	Sets Change Color mode. The Change Clr. function key menu appears on F7 to F12.
3.		Use the function key on the next page to set a color.
4.	[return]F12	Returns to the previous menu.

• Function keys

Main function key: None

Function keys:

Change Color menu: Initial value: Color Pattern 1
[Color Pattern 1] F7: Selects Anritsu-specified color 1.
[Color Pattern 2] F8: Selects Anritsu-specified color 2.
[Color Pattern 3] F9: Selects Anritsu-specified color 3.
[Color Pattern 4] F10: Selects Anritsu-specified color 4.
[Define User Color] F11: Displays the Define Clr. menu to set a user-specified color.
[Copy Color Ptn from] F7 Displays the [Copy from] menu to select an Anritsu-specified color as an original color to set a user-specified color.
[Color Pattern 1] F7: Selects Anritsu-specified color 1 as an original color.
[Color Pattern 2] F8: Selects Anritsu-specified color 2 as an original color.
[Color Pattern 3] F9: Selects Anritsu-specified color 3 as an original color.
[Color Pattern 4] F10: Selects Anritsu-specified color 4 as an original color.
[return] F12: Returns to the previous menu.
[Select Item frame **] F8: Selects the screen configuration field to set a display color.
Use a number ** from 0 to 16 for this setting. The number increases in step of one by pressing this key.
[Red *] F9: Set red intensity of the item frame selected by F8.
[Green *] F10: Set green intensity of the item frame selected by F8.
[Blue *] F11: Set blue intensity of the item frame selected by F8.
[return] F12: Returns to the previous menu.
[return] F12: Returns to the previous menu.

• Relation between screen assignment and number ** in [Select Item Frame **] F8 key

[Select Item Frame 0]	Back-screen of function keys
[Select Item Frame 1]	Back-screen of the main function keys
[Select Item Frame 2]	Display frame of function and main function keys
[Select Item Frame 3]	Characters and display frame of function and main function keys
[Select Item Frame 4]	Back-screen of waveform display
[Select Item Frame 5]	Scale line and frame of waveform display
[Select Item Frame 6]	Waveform display (1)
[Select Item Frame 7]	Waveform display (2)
[Select Item Frame 8]	Display other than function and main function keys
[Select Item Frame 9]	Characters right over the main function keys
[Select Item Frame 10]	Measurement execution error display
[Select Item Frame 11]	Template and zone frames
[Select Item Frame 12]	Marker
[Select Item Frame 13]	Window back-screen
[Select Item Frame 14]	Window shade and characters
[Select Item Frame 15]	(Not used)
[Select Item Frame 16]	Back-screen

4.3.5 Setting the common measurement parameters: Setup Common Parameter screen

• Switch to the Setup Common Parameter screen according to the following steps.
Set common measurement conditions on this screen.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode The Setup Common Parameter screen appears.
3.	[TX Measure]F1	The TX Measure (for transmitter test) function keys appear on F1 to F12.
	[RX Measure]F2	The RX Measure (for receiver test) function keys appear on F1 to F12.
	[Call Processing]F3	The Call Processign (sequence monitor) function keys appear on F1 to F12.

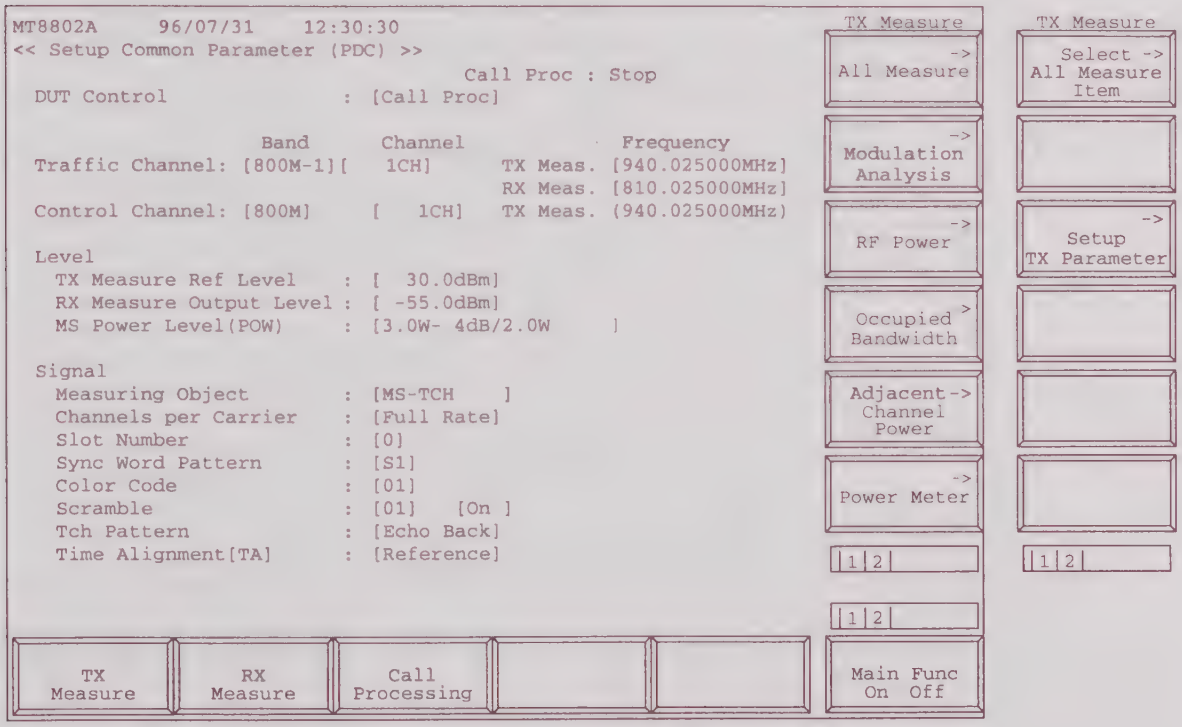
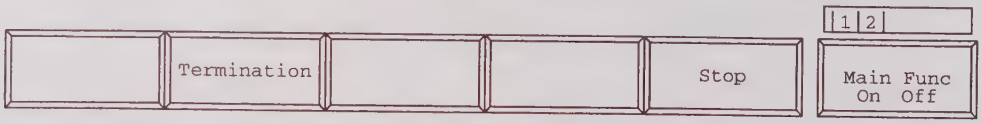


Fig. 4-6(1/3) Setup Common Parameter Screen (TX Measure)

- The 2nd page of the main function keys on the Setup Common Parameter screen (TX Measure)

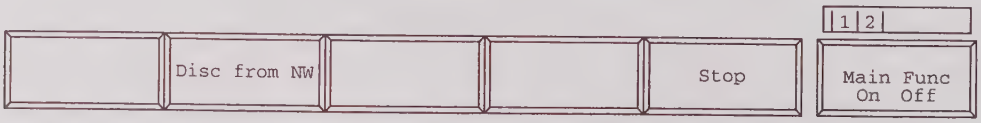
(1) When the MT8802A is the Call Processing status of Stop:

(2) When the MT8802A is the Call Processing status of Start, and the MS is the Call Processing status of Idle:



(3) When the MT8802A is the Call Processing status of Start, and the MS is the Call Processing status of the sequence execution.

(4) When the MT8802A is the Call Processing status of Start, and the MS is the Call Processing status of Communication:



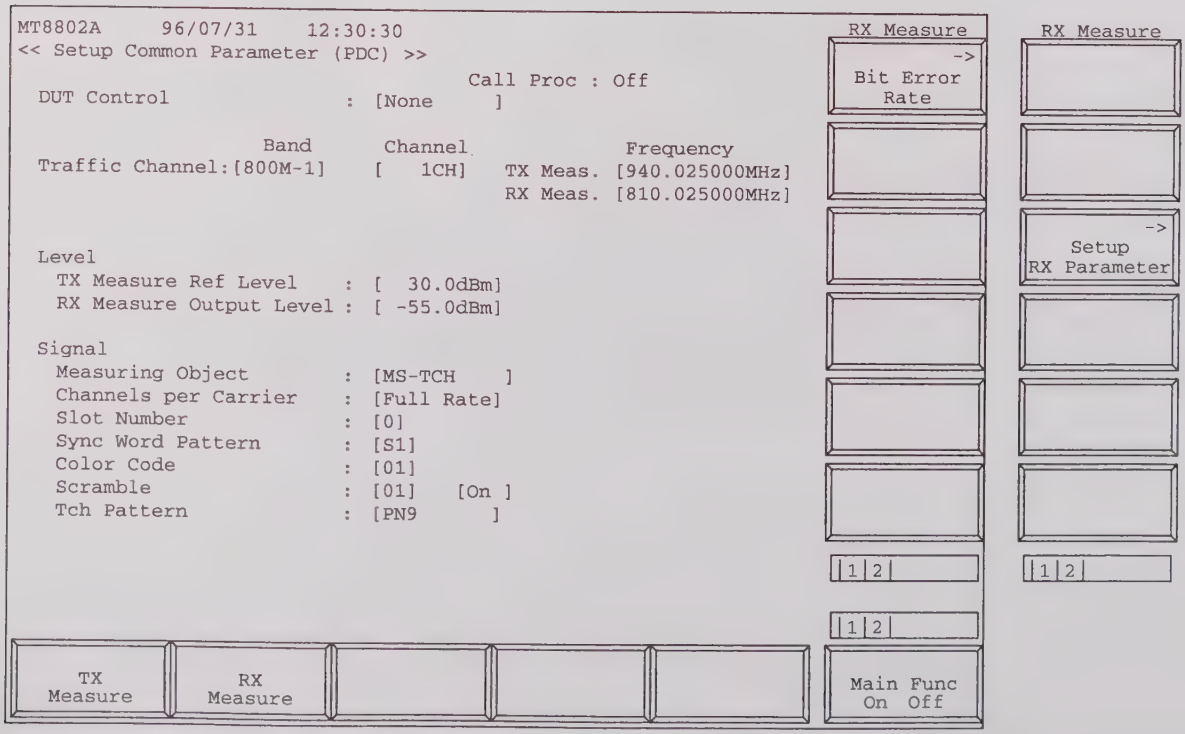


Fig. 4-6(2/3) Setup Common Parameter Screen (RX Measure)

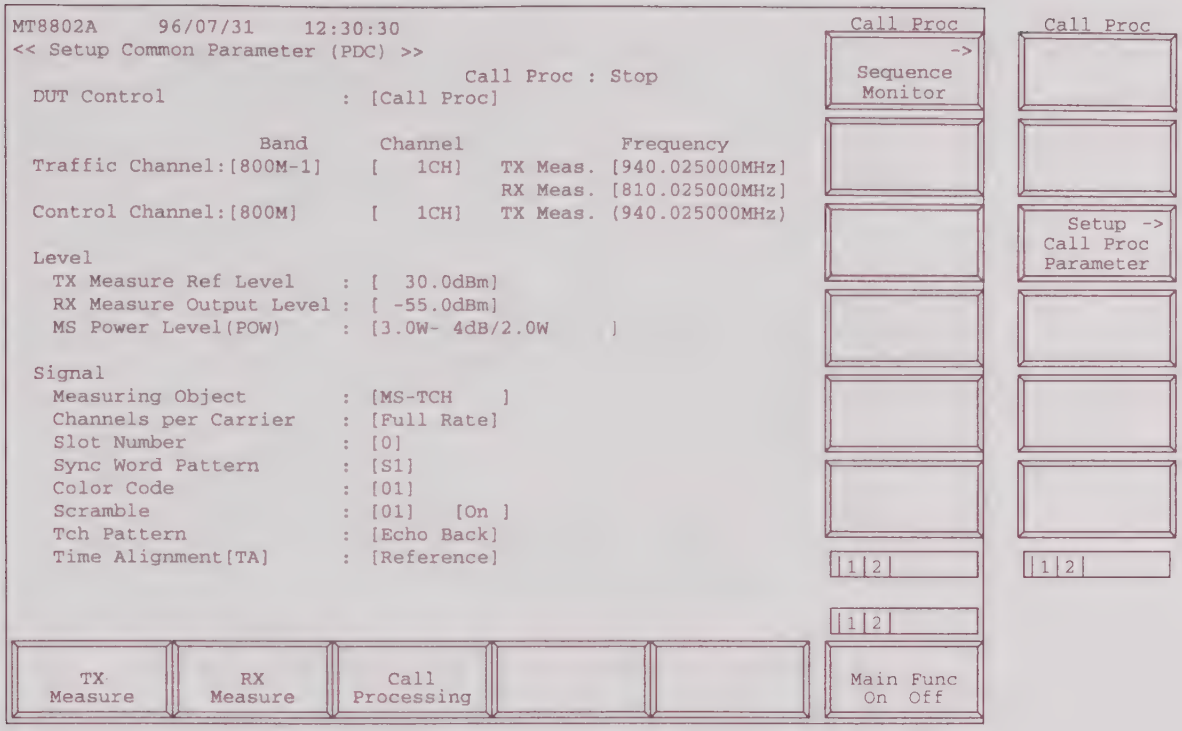
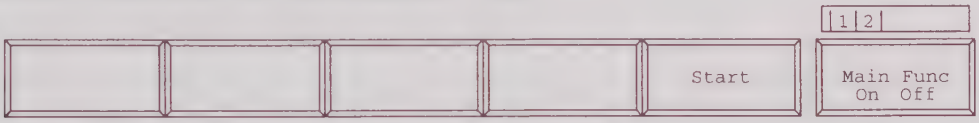


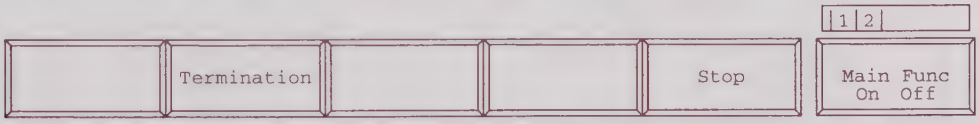
Fig. 4-6(3/3) Setup Common Parameter Screen (Call Porcessing)

- The 2nd page of the main function keys on the Setup Common Parameter screen (Call Processing)

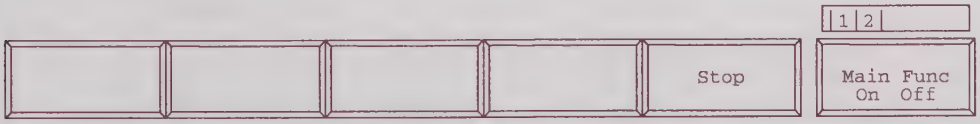
(1) When the MT8802A is the Call Processing status of Stop:



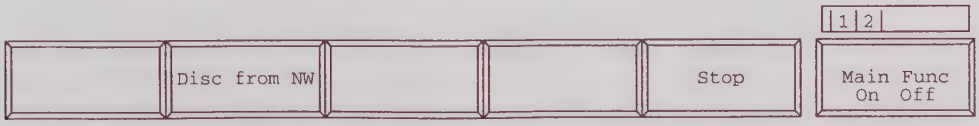
(2) When the MT8802A is the Call Processing status of Start, and the MS is the Call Processing status of Idle:



(3) When the MT8802A is the Call Processing status of Start, and the MS is the Call Processing status of the sequence execution.



(4) When the MT8802A is the Call Processing status of Start, and the MS is the Call Processing status of Communication:



• Set the following items:

Item	Range	Initial value	
DUT Control	None, Call Processing	None	Note1
Traffic Channel			Note2
Band	800M-1, 800M-2, 1.5G	800M-1	Note3
Channel			Note3
(When DUT Control:None)			
	0 to 9999	1	
	When Band and Channel are changed simultaneously:		
	10000 to 19999 (10000 corresponds to 800M-1)		
	20000 to 29999 (20000 corresponds to 800M-2)		
(When DUT Control:Call Proc)			
	0 to 720 (Band:800M-1)	1	
	1080 to 1680 (Band:800M-2)	1080	
	0 to 960 (Band:1.5G)	1	
	When Band and Channel are changed simultaneously:		
	10000 to 19999 (10000 corresponds to 800M-1)		
	20000 to 29999 (20000 corresponds to 800M-2)		
TX Measure Frequency			
(When DUT Control:None)			
	300kHz to 3.00GHz		
(When DUT Control:Call Proc)			
	940.000+0.025N[MHz]		
	(Band:800MHz-1,N:Channel)		
	925.000+0.025(N-1080)[MHz]		
	(Band:800MHz-2)		
	1429.000+0.025N[MHz]		
	(Band:1.5GHz)		
		940.025MHz	
		(Band:800MHz-1,Channel:1)	
RX Measure Frequency			
(When DUT Control:None)			
	300kHz to 3.00GHz		
(When DUT Control:Call Proc)			
	810.000+0.025N[MHz]		
	(Band:800MHz-1,N:Channel)		
	870.000+0.025(N-1080)[MHz]		
	(Band:800MHz-2)		
	1477.000+0.025N[MHz]		
	(Band:1.5GHz)		
		810.025MHz	
		(Band:800MHz-1,Channel:1)	
Control Channel			
Band	800MHz, 1.5GHz		Note4
Channel	0 to 720 (Band:800MHz)		Note4
	0 to 960 (Band:1.5GHz)		
TX Measure Frequency			
	940.000+0.025N[MHz]		
	(Band:800MHz,N:Channel)		
	1429.000+0.025N[MHz]		
	(Band:1.5GHz)		
		940.025MHz	
		(Band:800MHz,Channel:1)	

(Cont.)

Item	Range	Initial value	
Level			
TX Measure Ref Level			
(MAIN)	–5 to 42 dBm	30dBm	
(AUX)	–30 to 22 dBm	5dBm	
RX Measure Output Level			
(MAIN)	–143.0 to -28.0 dBm	–55.0dBm	
(AUX)	–143.0 to -3.0 dBm	–30.0dBm	
MS Power Level	3.0W	3.0W-4dB/2.0W	Note5
	3.0W-4dB/2.0W		
	3.0W-8dB/2.0W-4dB		
	3.0W-12dB/2.0W-8dB		
	3.0W-16dB/2.0W-12dB		
	3.0W-20dB/2.0W-16dB		
	3.0W-24dB/2.0W-20dB		
	3.0W-28dB/2.0W-24dB		
Signal			
Measuring Object			Note6
	MS-TCH	MS-TCH	
	Continuous(only when DUT Control is None)		
--- When Measuring Object:MS-TCH ---			
Channels per Carrier			
	Full Rate	Full Rate	
	Half Rate		
Slot Number	0 to 2 at Full Rate	0	
	0 to 5 at Half Rate	0	
Sync Word Pattern			Note7
	S1,S2,S3,S4,S5,S6	S1	
Color Code	00 to FF	01	
Scramble	On,Off	On	
Scramble Code	00 to FF	01	
Tch Pattern	PN9,PN15,	PN9	
	Echo Back (only when DUT Control is Call Proc.)		
Time Alignment	Currently	Reference	Note8
	1Symbol		
	2Symbol		
	3Symbol		
	4Symbol		
	5Symbol		
	6Symbol		
	Reference		
--- When Measuring Object:Continuous ---			
Pattern	PN9,PN15,0000 to 1111(4Bits)	PN9	

Note1: When DUT Control is None, the MT8802A can't control DUT. So user should control DUT to measure.
When DUT Control is Call Processing(C/P),call processing function on the MT8802A is available.

Note2: Traffic Channel is used foe TX/RX measurement using the frequency with the measuring objects of Continuous and MS-TCH.
Control Channel is used in the Call Processing mode.

Note3: When being at Communication state in Call Processing mode, the Band and Channel can be changed with Hand Over sequence.

Note4: When DUT Control is Call Processing, this parameter is available.

Note5: When DUT Control is Call Processing, this parameter is available.
MS Power Level data is send through the Other sequence of the call-processing to control MS output level.

Note6: When DUT Control is Call Processing, Measuring Object becomes MS-TCH.

Note7: When DUT Control is Call Processing, Sync Word Pattern is a fixed value depending on Slot Number.

Slot Number	Pattern
0	S1 (785B4)
1	S2 (62DC9)
2	S3 (7E28A)
3	S4 (56B15)
4	S5 (AE9B3)
5	S6 (B2621)

Note8: When DUT Control is Call Processing, Time Alignment becomes valid.

• Fixed data

Modulation (Modulation system)

Modulation (Modulation system)
π/4DQPSK

Bit Rate (Data transmission rate)
42.0 kbps

Filter (Band-limit filter)
Root Nyquist, $\alpha = 0.5$

• Notes on setup items

(1) Relationship between measurement frequencies and channels

The PDC system uses different transmit and receive frequencies for the same frequency channel. If a frequency channel is selected, the relationship between the channel and the transmit/receive frequencies depend on the unit to be measured (that is, signals to be measured).

When Measuring Object is set to Continuous, the relationship between the frequency channel and the transmit/receive frequencies that is set immediately before is used.

RF Signal Measurement Frequency of the PDC System

Band	Channel	TX Measure Freq. (MHz)	RX Measure Freq. (MHz)
800 MHz-1	0	940.000	810.000
	1	940.025	810.025
	–	–	–
	720	958.000	828.000
800 MHz-2	1080	925.000	870.000
	1081	935.000	870.025
	–	–	–
	1680	940.000	885.000
1.5 GHz	0	1429.000	1477.000
	1	1429.025	1477.025
	–	–	–
	960	1453.000	1501.000

(2) Channels Per Carrier

The PDC system sets the number of slots used per carrier as Channels Per Carrier.
The "Full rate" uses signal of three time-slot cycle per carrier; and the "Half rate" uses signal of six time-slot cycle per carrier.
The PHS system sets four slots (a total of eight slots for transmit and receive.) per carrier.

- Main function keys:

1st page

[TX Measure] F1	Displays the TX Measure (transmitter measurement) function keys appear on F7 to F12.
[RX Measure] F2	Displays the RX Measure (receiver measurement) function keys on F7 to F12. When DUT Control is None, this is appeared.
[Call Processing]F4	Displays the Call Processing (sequence monitor) function keys on F7 to F12. When DUT Control is Call Processing, this is appeared.

2nd page

Call Processing (for sequence monitor) main function keys:

The following main function is displayed depending on the Call-Processing execution state.

[Termination]F2	Executes Termination sequence for the MT8802A to call MS.
[Disk from NW]F2	Executes Network Release sequence.
[Start]F5	Executes the Call-Processing function for the MT8802A to enter Idle state.
[Stop]F5	Stops the Call-Processing function of the MT8802A.

TX Measure (for transmitter test) function keys:

1st page

[All Measure] (F7):	Displays the All Measure screen.
[Modulation Analysis] (F8):	Displays the Modulation Analysis screen.
[RF Power] (F9):	Displays the RF Power screen.
[Occupied Bandwidth] (F10):	Displays the Occupied Bandwidth screen.
[Adjacent Channel Power] (F11):	Displays the Adjacent Channel Power screen.
[Power Meter] (F12):	Displays the Power Meter screen.

2nd page

[Setup TX Parameter] (F7):	Displays the Setup TX Measure Parameter screen.
[Select All Measure Item] (F8):	Displays the Select All Measure Item screen.

RX Measure (for receiver test) function keys:

1st page

[Bit Error Rate] (F7):	Displays the Bit Error Rate screen.

2nd page

[Setup RX Parameter] (F9):	Displays the Setup RX Measure Parameter screen.4.3.6

Call Processing function keys:

1st page

[Sequence Monitor]F7:	Displays the Sequence Monitor screen.

2nd page

[Setup Call Proc Parameter]F9:	Displays the Setup Call Processing Parameter screen.

• Comment on the Call Processing main function keys

When DUT Control is set to Call Processing, the 2nd page is appeared.
The 2nd page indicates the call-processing trigger keys.
These 2nd-page main-function keys are displayed depending on the call-processing status, as described below:

State1: Stop state
Main function key --- [Start]F5

State2: Idle state
Main function keys --- [Termination]F2, [Stop]F5

State3: Communication state
Possible to perform TX measurement in this state.
Main function keys --- [Disc from NW]F2, [Stop]F5

State4: Transition state between CCH and TCH
Execution states of the sequences --- Origination, Termination, Disc from MS, and Disc from NW
Main function key --- [Stop]F5

State5: Transition state between TCHs
Execution states of the sequence --- Hand Over
Main function key --- [Stop]F5

4.3.6 Transmitter test: TX Measure mode

This paragraph describes the following transmitter test items:

1. Setting parameters (Setup TX Measure Parameter screen) and all item measurement (All Measure screen) items (Select All Measure Item screen)
2. All item measurement (All Measure screen)
3. Modulation analysis [1] (Modulation Analysis screen: Value display)
   Modulation analysis [2] (Waveform Display screen: Waveform display of 5 screens)
4. Power measurement (RF Power screen, Setup Template screen)
5. Occupied frequency bandwidth measurement (Occupied Bandwidth screen)
6. Adjacent channel leakage power measurement (Adjacent Channel Power screen)
7. Power meter (Power Meter screen)

(1) Setting the parameters: Setup TX Measure Parameter screen

This paragraph describes how to set parameters (Setup TX Measure Parameter screen) to conduct the transmitter test (TX Measure mode).

(a) Setting the parameters: Setup TX Measure Parameter screen

• Switch to the Setup TX Measure Parameter screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	Next Menu [▲]	Displays the second page of the TX Measure menu.
5.	[Setup TX Measure Parameter]F9	Displays the Setup TX Measure Parameter screen.

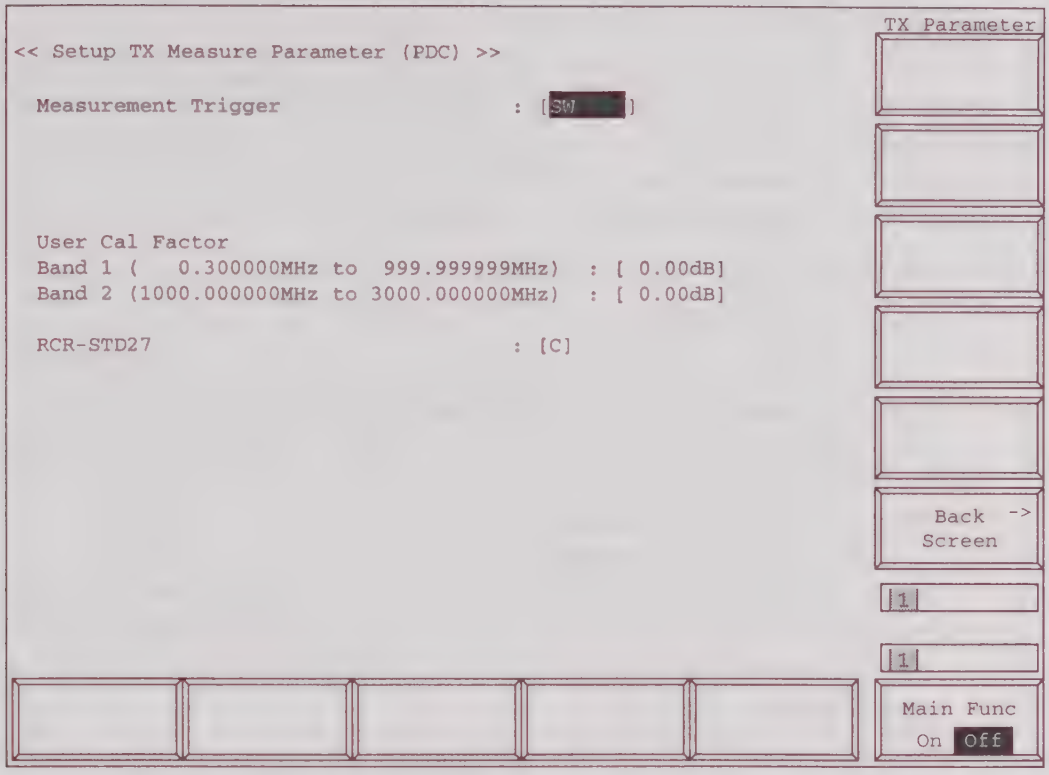


Fig. 4-7 Setup TX Measure Parameter Screen

Note: When DUT Control is Call Proc, the setting item of Measurement Trigger does not appear, and is forcibly set to SW.

• Set the following items:

Item	Range	Resolution	Initial value	
Measurement Trigger	Video, SW		SW	Note1
User Cal Factor (User-level calibration value)				
	–55.00 to 55.00 dB	0.01 dB	0.00 dB	Note2
RCR-STD27 (Signal selection conforming to RCR standard)				
	B, C		C	

Note 1: When the Measuring Object is MS-TCH, Measurement Trigger appears.
When the Measurement Trigger is SW, the signal is detected using theSync Word (see Paragraph 4.3.5).
When the Measurement Trigger is Video, the signal is detected for that level.

Note 2: User Cal Factor (User level calibration value)
This parameter is used to compensate the increase or decrease of the signal level caused in the signal route from the DUT to the RF input connector of the MT8802A.
For setup example, see Paragraph 4.3.1, (3) "Correcting RF cable loss when conducting the transmitter test".

Note 3: The value obtained from the following equation is displayed as an RF level measurement result:
Displayed measurement result value = Measured value + User Cal Factor
For User Cal Factor, the loss in the RF cable connecting the MT8802A and device under test is set as a correction value.(See paragraph 4.3.1, (2))

• Function keys

Main function key: None

Function key: TX Parameter

[Back Screen] (F12): Displays the previous screen.

(b) Setting items for all item measurement of the transmitter: Select All Measure Item screen

- Switch to the Select All Measure Item screen according the following steps:

  Set all item measurement (All Measure screen) items on this screen.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	Next Menu [▲]	Displays the second page of the TX Measure menu.
5.	[Select All Measure Item]F7	Displays the first page of the Select All Measure Item screen.
6.	[Next Page]F8	Displays the second page of the Select All Measure Item screen.

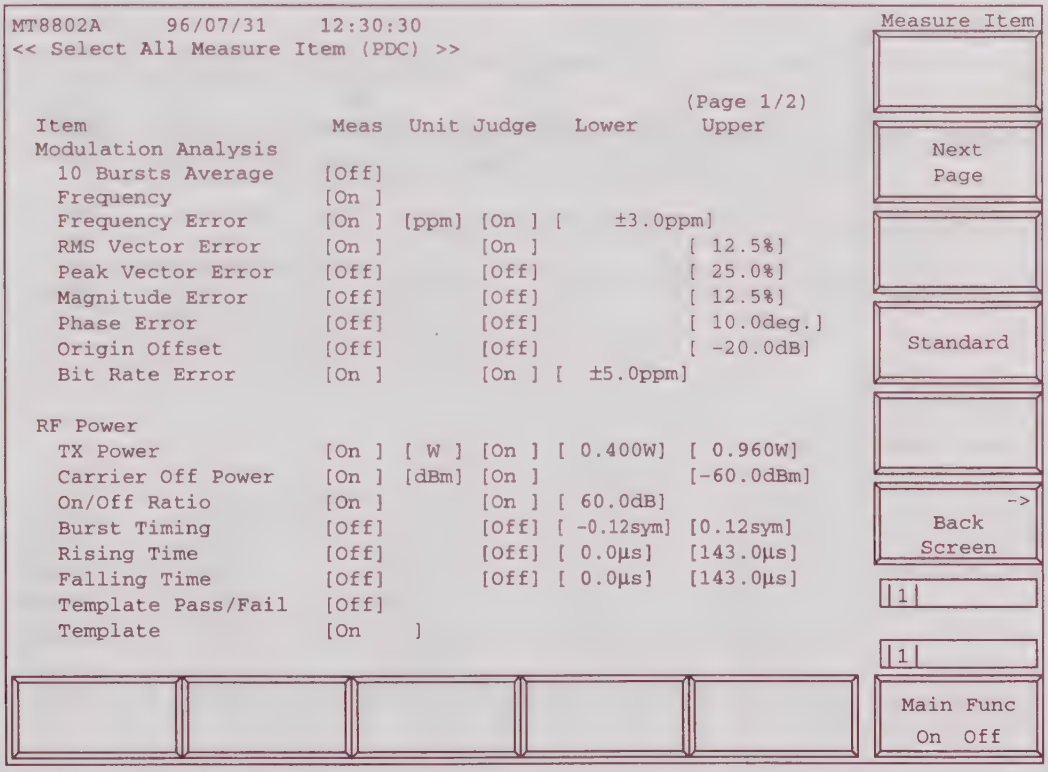

MT8802A 96/07/31 12:30:30
<< Select All Measure Item (PDC) >>
(Page 1/2)
Item Meas Unit Judge Lower Upper
Modulation Analysis
10 Bursts Average [Off]
Frequency [On]
Frequency Error [On] [ppm] [On] [±3.0ppm]
RMS Vector Error [On] [On] [12.5%]
Peak Vector Error [Off] [Off] [25.0%]
Magnitude Error [Off] [Off] [12.5%]
Phase Error [Off] [Off] [10.0deg.]
Origin Offset [Off] [Off] [-20.0dB]
Bit Rate Error [On] [On] [±5.0ppm]
RF Power
TX Power [On] [W] [On] [0.400W] [0.960W]
Carrier Off Power [On] [dBm] [On] [-60.0dBm]
On/Off Ratio [On] [On] [60.0dB]
Burst Timing [Off] [Off] [-0.12sym] [0.12sym]
Rising Time [Off] [Off] [0.0µs] [143.0µs]
Falling Time [Off] [Off] [0.0µs] [143.0µs]
Template Pass/Fail [Off]
Template [On]
Measure Item
Next Page
Standard
->
Back Screen
1
1
Main Func On Off

Fig. 4-8 Select All Measure Item Screen (First Page)

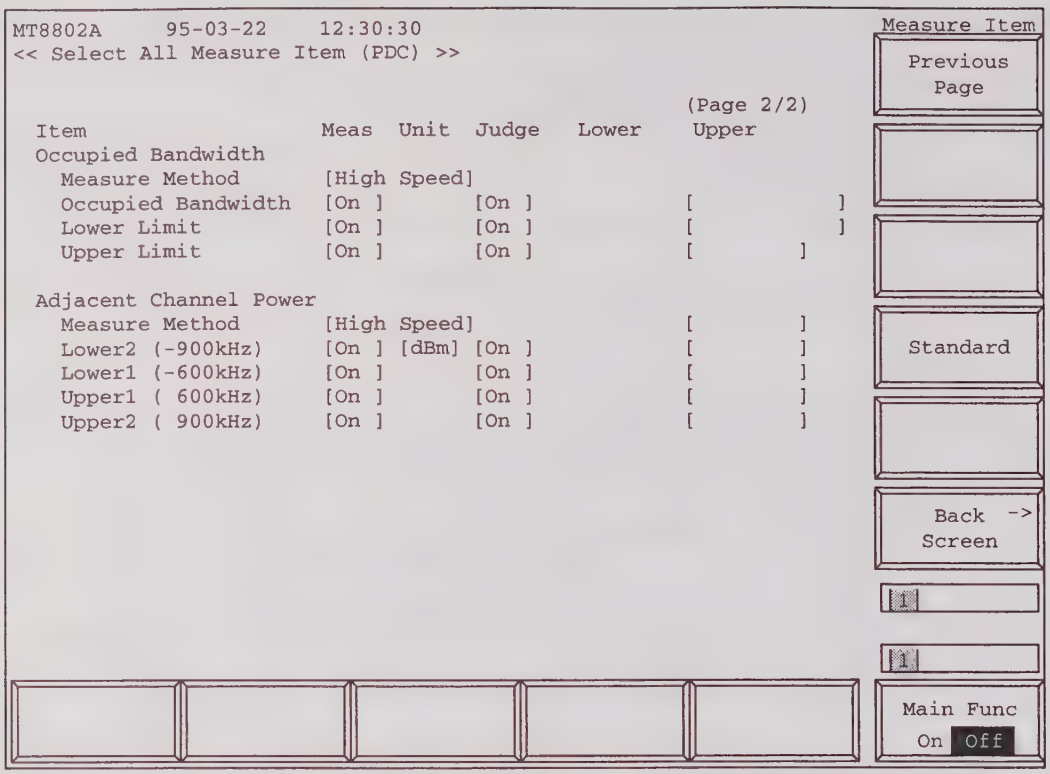

MT8802A 95-03-22 12:30:30
<< Select All Measure Item (PDC) >>
(Page 2/2)
Item Meas Unit Judge Lower Upper
Occupied Bandwidth
Measure Method [High Speed]
Occupied Bandwidth [On] [On] [ ]
Lower Limit [On] [On] [ ]
Upper Limit [On] [On] [ ]
Adjacent Channel Power
Measure Method [High Speed] [ ]
Lower2 (-900kHz) [On] [dBm] [On] [ ]
Lower1 (-600kHz) [On] [On] [ ]
Upper1 (600kHz) [On] [On] [ ]
Upper2 (900kHz) [On] [On] [ ]
Measure Item
Previous Page
Standard
Back -> Screen
Main Func
On Off

Fig. 4-9 Select All Measure Item Screen (Second Page)

- Set items in the following ranges:

Item	Measurement On/Off	Unit (*1)	Judgment On/Off	Judgment lower limit value	Judgment upper limit value
1st page					
Modulation Analysis					
10 Bursts Average	On, Off				
Frequency	On, Off	(MHz)			
Frequency Error	On, Off	kHz, ppm	On, Off	None	Available(±)(*2)
RMS Vector Error	On, Off	(%)	On, Off	None	Available
Peak Vector Error	On, Off	(%)	On, Off	None	Available
Magnitude Error	On, Off	(%)	On, Off	None	Available
Phase Error	On, Off	(deg)	On, Off	None	Available
Origin Offset	On, Off	(dB)	On, Off	None	Available
Bit rate Error	On, Off	(ppm)	On, Off	None	Available
RF Power					
TX Power	On, Off	dBm, W	On, Off	Available	Available
Carrier Off Power	On, Off	dBm, W	On, Off	None	Available
On/Off Ratio	On, Off	(dB)	0n, Off	None	Available
Burst Timing	On, Off	(symbol)	On, Off	Available	Available
Modulation Power	0n, Off	dBm, W	0n, Off	Available	Available (*4)
Rising Time	On, Off	(us)	0n, Off	Available	Available
Falling Time	On, Off	(us)	On, Off	Available	Available
Template Pass/Fail	On, Off				
Template	On, On&Off				(*3)

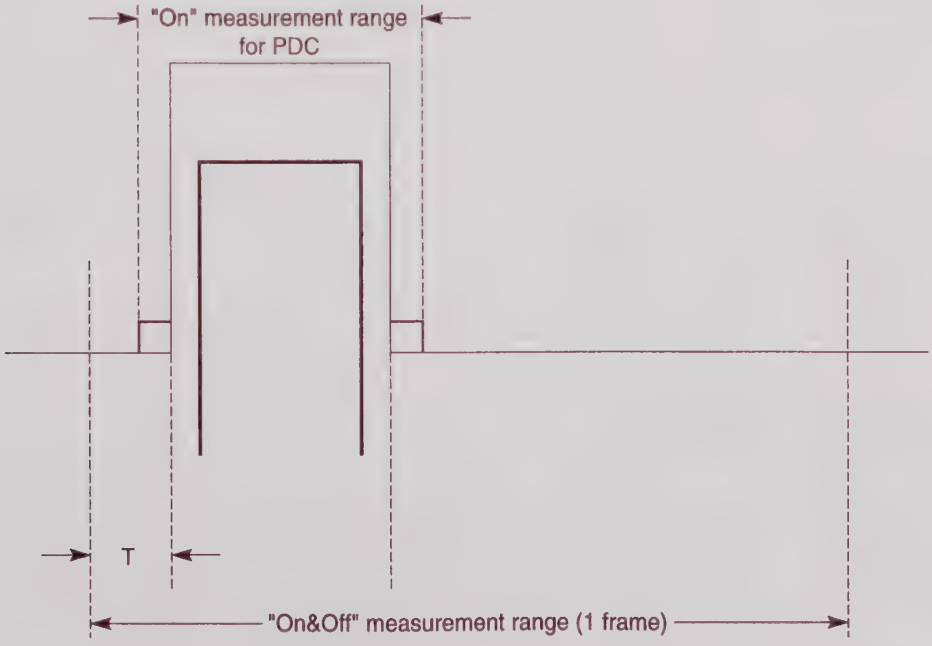
Item	Measurement On/Off	Unit (*1)	Judgment On/Off	Judgment lower limit value	Judgment upper limit value
2nd page					
Occupied Bandwidth					
Measure Method	Spectrum, High Speed				
Occupied Bandwidth	On, Off	(kHz)	On, Off	None	Available
Lower Limit	On, Off	(kHz)	On, Off	Available	X
Upper Limit	On, Off	(kHz)	On, Off	None	Available
Adjacent Channel Power					
Measure Method	Spectrum(All), Spectrum(Separate), High Speed				
Lower2 (-900kHz)	On, Off	dBm,dB,nW,μW,mW	On, Off	None	Available
Lower1 (-600kHz)	On, Off	dBm,dB,nW,μW,mW	On, Off	None	Available
Upper1 (600kHz)	On, Off	dBm,dB,nW,μW,mW	On, Off	None	Available
Upper2 (900kHz)	On, Off	dBm,dB,nW,μW,mW	On, Off	None	Available

*1 Values in parentheses are fixed units.

*2 The set judgment upper limit value is considered both the upper and lower limit values. (Judgment is made using the absolute value of an error from the reference value.)

*3 Template On: A signal waveform is applied to measurement only in a section with a burst.

Template On&Off: A signal waveform is applied to measurement in both sections with and without a burst. (See the figure below.)



*4 None for PDC

• When the [Standard:F10] function key is pressed, items in the all measurement value list (All Measure screen) are set to the following standard contents:

Item	Measurement	Unit	Judgment	Judgment lower limit value	Judgment upper limit value
1st page					
Modulation Analysis					
10 Bursts Average	Off				
Frequency	On	(MHz)			
Frequency Error	On	ppm	On		±3.0 ppm
RMS Vector Error	On	(%)	On		12.5%
Peak Vector Error	Off				
Magnitude Error	Off				
Phase error	Off				
Origin Offset	Off				
Bit rate Error	On	(ppm)	On		±5.0 ppm
RF Power					
TX Power	On	W	On	0.4 W	0.960 W
Carrier Off Power	On	dBm	On		–60 dBm
On/Off Ratio	On	(dB)	On	60.0 dB	
Burst Timing	Off				
Rising Time	Off				
Falling Time	Off				
Template Pass/Fail	Off				
Template	On				
2nd page					
Occupied Bandwidth					
Measure Method	High Speed				
Occupied Bandwidth	On	(kHz)	On		32 kHz
Lower Limit	Off				
Upper Limit	Off				
Adjacent Channel Power					
Measure Method	High Speed				
Lower2 (–100 kHz)	On	dB	On		–60.0 dB
Lower1 (–50 kHz)	On	dB	On		–45.0 dB
Upper1 (50 kHz)	On	dB	On		–45.0 dB
Upper2 (100 kHz)	On	dB	On		–60.0 dB

• Function keys

Main function key:	None
Function key:	All Measure
1st page	
[Next Page] (F8):	Displays the second page.
[Standard] (F10):	Sets the standard value.
[Back Screen] (F12):	Displays the previous screen.
2nd page	
[Previous Page] (F7):	Displays the first page.
[Standard] (F10):	Sets the standard value.
[Back Screen] (F12):	Displays the previous screen.

(2) Transmitter all item measurement: All Measure screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure and display the items (see paragraph 4.3.6, (1), (b)) set on the Select All Measure Item screen.

- Display the All Measure screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[All Measure]F7	Displays the first page of the All Measure screen.
5.	[Next Page]F8	Displays the second page of the All Measure screen.

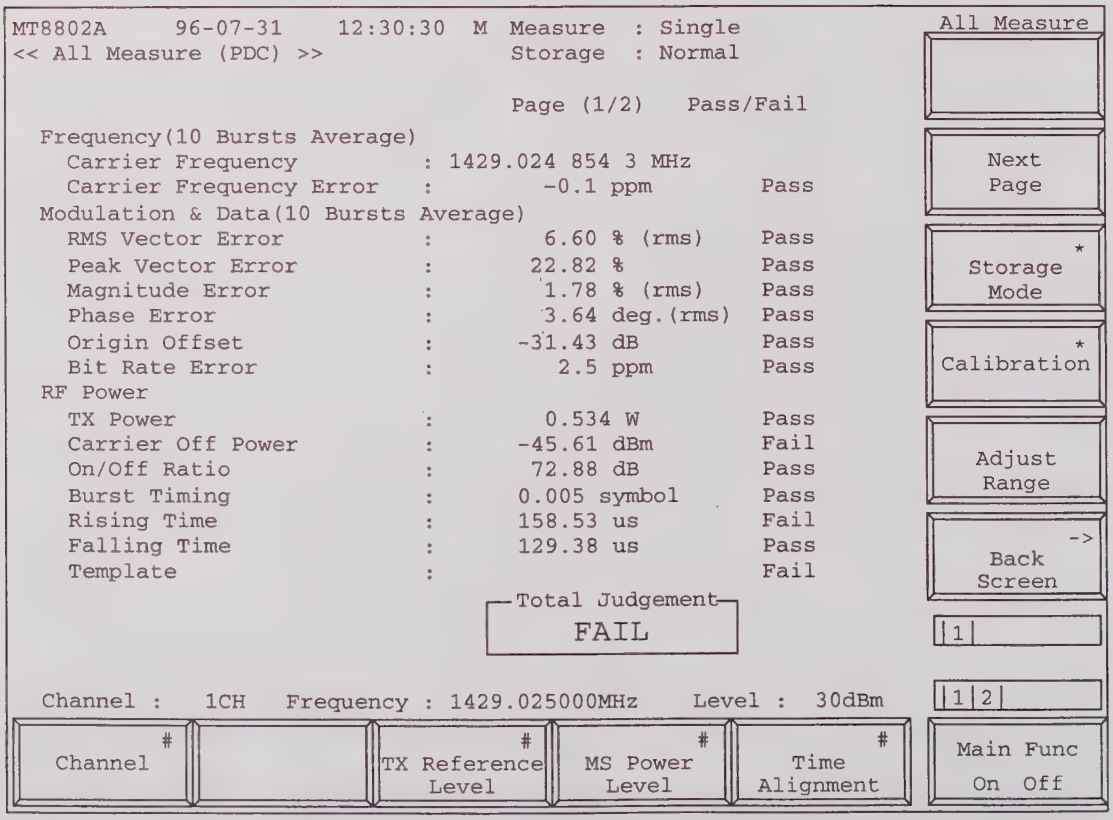

MT8802A 96-07-31 12:30:30 M Measure : Single
<< All Measure (PDC) >> Storage : Normal
Page (1/2) Pass/Fail
Frequency(10 Bursts Average)
Carrier Frequency : 1429.024 854 3 MHz
Carrier Frequency Error : -0.1 ppm Pass
Modulation & Data(10 Bursts Average)
RMS Vector Error : 6.60 % (rms) Pass
Peak Vector Error : 22.82 % Pass
Magnitude Error : 1.78 % (rms) Pass
Phase Error : 3.64 deg.(rms) Pass
Origin Offset : -31.43 dB Pass
Bit Rate Error : 2.5 ppm Pass
RF Power
TX Power : 0.534 W Pass
Carrier Off Power : -45.61 dBm Fail
On/Off Ratio : 72.88 dB Pass
Burst Timing : 0.005 symbol Pass
Rising Time : 158.53 us Pass
Falling Time : 129.38 us Pass
Template : Fail
Total Judgement
FAIL
Channel : 1CH Frequency : 1429.025000MHz Level : 30dBm
All Measure
Next Page
Storage Mode
Calibration
Adjust Range
Back Screen
1
1 2
Channel
TX Reference Level
MS Power Level
Time Alignment
Main Func On Off

Fig. 4-10 Example of All Measure Screen (First Page)

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)

The main function keys on the TX measurement screen (DUT Control: None)

Note: When all measurement items are Pass, Total Judgment becomes "PASS." If any one item is Fail, Total Judgement becomes "FAIL."

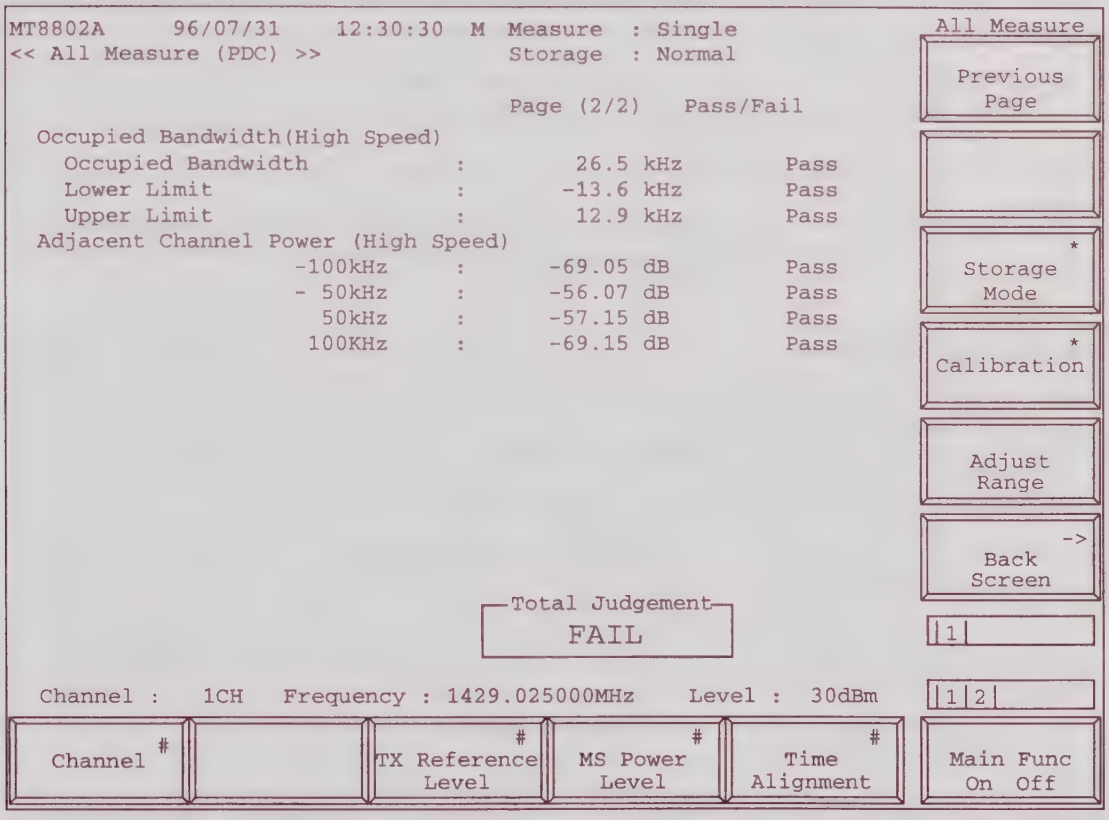


Fig. 4-11 Example of All Measure Screen (Second Page)

The 2nd page of the main function keys on the TX measurement screen (DUT Control: Call Proc)

The main function keys on the TX measurement screen (DUT Control: None)

- Main function keys

1st page

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3 — Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5 — Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3 — Changes the reception level of MS (output level from the MT8802A).
Disappears when DUT Control is None.

- Function keys: All Measure

[Previous Page]F7 — Displays the previous page.

[Next Page]F8 — Displays the next page.

[Storage Mode]F9: — Displays the storage mode setup menu.

- [Normal]F7: — Sets normal mode.(Initial value)
- [Average]F8: — Sets averaging mode.
  Measure mode is set to Single. (No screen is displayed.)
- [Average Count]F9: — Sets an averaging count.
  2 to 9999 Initial value:10
- [return]F12: — Returns to the previous menu.

[Calibration]F10: — Displays the level calibration menu.

- [Manual Calibration]F7: — Performs level calibration.
  During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: — Deletes level calibration data.
- [return]F12: — Returns to the previous menu.

[Adjust Range]F11: — Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal.(See paragraph 4.3.1(2))

[Back Screen]F12: — Displays the previous screen.

(3) Modulation analysis: Modulation Analysis screen (value display)
Waveform Display screens (waveform display: 5 screens)

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup Digital TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to analyze a modulated signal from the transmitter, and display a measured value or waveform.

There is one value-display screen. A waveform display screen can be used to select and display one of five measured waveforms (Constellation, Eye Diagram, Vector Error, Phase Error, or Magnitude Error).

(a) Modulation analysis (value display): Modulation Analysis screen

- Display the Modulation Analysis screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&TR Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[Modulation Analysis]F8	Displays the Modulation Analysis screen.

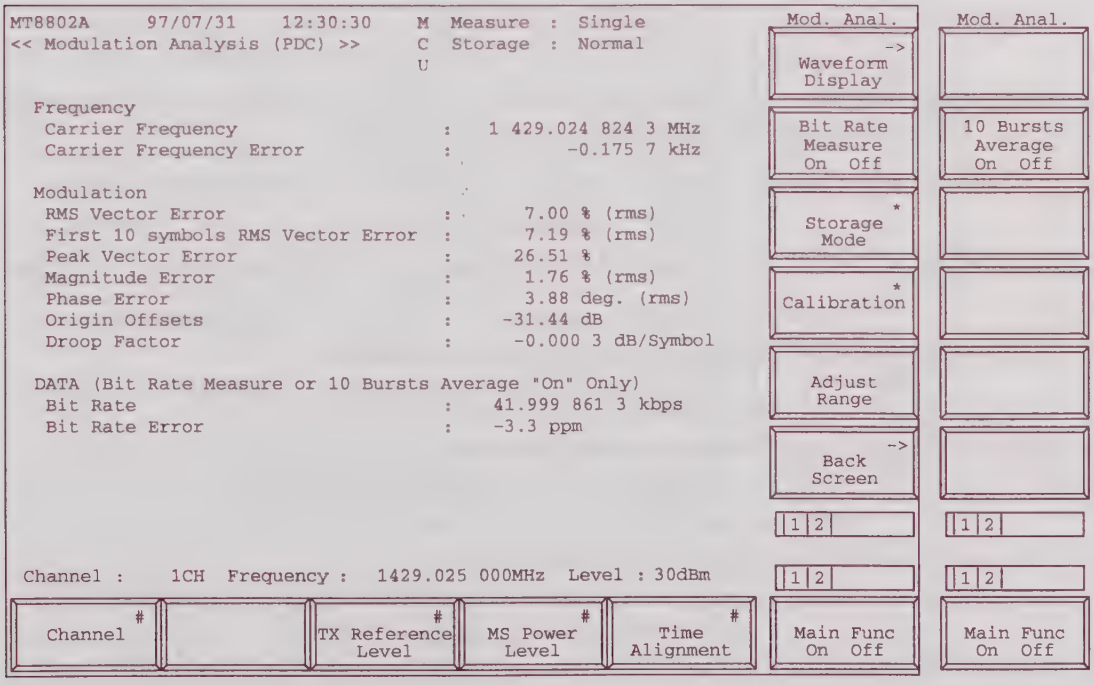

MT8802A 97/07/31 12:30:30 M Measure : Single
<< Modulation Analysis (PDC) >> C Storage : Normal
U
Frequency
Carrier Frequency : 1 429.024 824 3 MHz
Carrier Frequency Error : -0.175 7 kHz
Modulation
RMS Vector Error : 7.00 % (rms)
First 10 symbols RMS Vector Error : 7.19 % (rms)
Peak Vector Error : 26.51 %
Magnitude Error : 1.76 % (rms)
Phase Error : 3.88 deg. (rms)
Origin Offsets : -31.44 dB
Droop Factor : -0.000 3 dB/Symbol
DATA (Bit Rate Measure or 10 Bursts Average "On" Only)
Bit Rate : 41.999 861 3 kbps
Bit Rate Error : -3.3 ppm
Channel : 1CH Frequency : 1429.025 000MHz Level : 30dBm
Mod. Anal.
Waveform Display
Bit Rate Measure On Off
Storage Mode
Calibration
Adjust Range
Back Screen
Mod. Anal.
10 Bursts Average On Off
Channel
TX Reference Level
MS Power Level
Time Alignment
Main Func On Off
Main Func On Off

Fig. 4-12 Modulation Analysis Screen

The 2nd page of the main function keys on the TX mesurement screen (DUT Control: Call Proc)

The main function keys on the TX mesurement screen (DUT Control: None)

Note: When the 10 Burst Average is set to on, the items of Frequency and Modulation display the averaged values of the continuous 10 bursts (or maximum value for peak value display). When the 10 Burst Average is set to on and also the Storage Mode is set to Average, the measurement is performed for the ten times of the bursts of the Average-Count set value.

- Main function keys

1st page

[Channel]F1	Changes channel number. When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.
[TX Frequency]F2	Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[TX Reference Level]F3	Changes the MT8802A reference level to measure the transmission level from MS.
[MS Power Level]F4	Changes the transmission level from MS. Disappears when DUT Control is None.(Para.4.3.5)
[Time Alignment]F5	Changes Time Alignment of MS. Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3	Changes the reception level of MS (output level from the MT8802A). Disappears when DUT Control is None.

Function keys: Mod.Anal.

1st page

[Waveform Display]F7: Displays the Waveform Display screen. (See paragraph 4.3.6, (3), (b).)

[Bit Rate Measure On/Off]F8: Sets Bit Rate and Bit Error Rate measurements on and off.
When this item is set Off, Data:Bit Rate and Bit Rate Error are not displayed.

[Storage Mode]F9: Displays the storage mode setup menu.

- [Normal]F7: Sets normal mode (initial value).
- [Average]F8: Sets averaging mode.
  Measure mode is set to Single.
- [Average Count]F9: Sets an averaging count.
  2 to 9999
- [return]F12: Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

- [Manual Calibration]F7: Performs level calibration.
  During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: Deletes level calibration data.
- [return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1(2))

[Back Screen]F12: Displays the previous screen.

2nd page

[10 Bursts Average On/Off]F8: Used for measurement of 10 bursts at one time.
When 10 Bursts Average is On, the MT8802A measures below.

1. "Bit Rate" and "Bit Rate Error" items.
2. 10 bursts average of other measurement items except for "Peak Vector Error".
3. Peak hold of 10 Bursts for Peak Vector Error.
   If Storage mode is "Average" and 10 Bursts average is "On", the MT8802A measures 10 times "Average Count" burstsat one time.
   Initial value: Off

(b) Modulation analysis (waveform display): Waveform Display screens

- Display the following five Waveform Display screens according to the steps described below:

Constellation: I to Q constellation
Eye Diagram: Symbol to I and Symbol to Q eye patterns
Phase Error: Symbol to phase error
Magnitude Error: Symbol to magnitude error

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[Modulation Analysis]F8	Displays the Modulation Analysis screen.
5.	[Waveform Display]F7	Displays the Waveform Display screen (initial value: Constellation).
6.	[Trace Format]F7	Displays the Trace Format menu.
7.	[Constellation] F7	Displays the Waveform Display screen (Constellation).
	[Eye Diagram] F8	Displays the Waveform Display screen (Eye Diagram).
	[Vector Error]F9	Displays the Waveform Display screen (Vector Error).
	[Phase Error] F10	Displays the Waveform Display screen (Phase Error).
	[Magnitude Error]F11	Displays the Waveform Display screen (Magnitude Error).

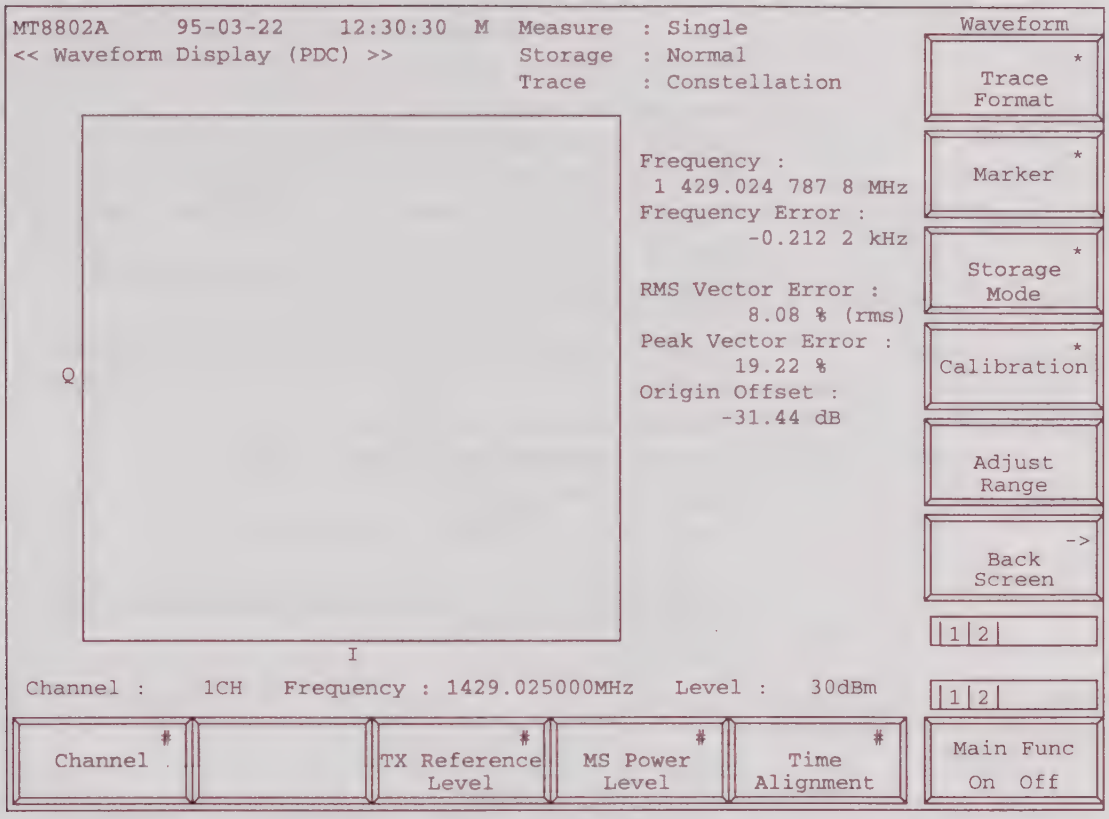
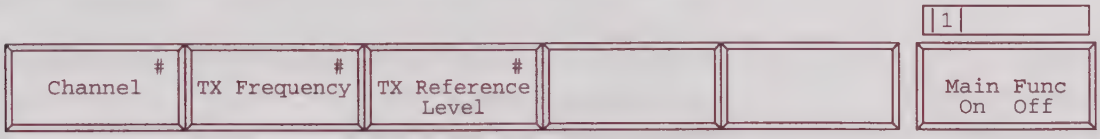


Fig. 4-13 Waveform Display Screen (Constellation)

The 2nd page of the main function keys on the TX mesurement screen (DUT Control: Call Proc)

The main function keys on the TX mesurement screen (DUT Control: None)



- Main function keys

1st page

[Channel]F1
Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2
Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3
Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4
Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5
Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3
Changes the reception level of MS (output level from the MT8802A).
Disappears when DUT Control is None.

- Function keys:

1st page (common for all waveforms)

[Trace Format]F7:
Displays the Trace Format menu.

- [Constellation]F7: Displays the Waveform Display screen (Constellation) (initial value).
- [Eye Diagram]F8: Displays the Waveform Display screen (Eye Diagram).
- [Vector Error]F9: Displays the Waveform Display screen (Vector Error).
- [Phase Error]F10: Displays the Waveform Display screen (Phase Error).
- [Magnitude Error]F11: Displays the Waveform Display screen (Magnitude Error).
- [return]F12: Returns to the previous menu.

[Marker]F8:
Displays the Marker menu.

- [Normal]F7: Sets the normal marker mode.
  The screen enters the marker-position input wait state.
  Resolution:
  0.1 symbols (when Interpolation on Constellation display is 10 Points)
  1 symbol (under other than the condition above)
- [Off]F8: Sets marker mode off and clears a marker display (initial value).
- [return]F12: Returns to the previous menu.

[Storage Mode]F9:
Displays the storage mode setup menu.

- [Normal]F7: Sets normal mode (initial value).
- [Over Write]F8: Sets overwriting mode.
- [return]F12: Returns to the previous menu.

[Calibration]F10:
Displays the level calibration menu.

- [Manual Calibration]F7: Performs level calibration.
  During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: Deletes level calibration data.
- [return]F12: Returns to the previous menu.

[Adjust Range]F11:
Sets the measurement level range (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1 (2))

[Back Screen]F12:
Displays the previous screen.

2nd page (when a Constellation waveform is displayed)

[Interpolation]F7: Displays the interpolation mode menu.

- [Non]F7: Sets interpolation mode to no (initial value). (Symbol points are displayed with dots.)
- [Linear]F8: Sets interpolation mode to linear interpolation. (Symbol points are connected by a straight line.)
- [10 Points]F9: Sets interpolation mode to 10-point interpolation. (Symbol points are connected with interpolation of ten divisions.)
- [return]F12: Returns to the previous menu.

[Error Scale]F8: Displays the error circle display menu to select the size of the error circles that displays error ranges relating to origins indicating the ideal symbol points and ideal carrier elements of constellation display.

- [5%]F7: Displays 5% error circles.
- [10%]F8: Displays 10% error circles.
- [20%]F9: Displays 20% error circles.
- [Off]F10: Clears all the error circles (initial value).
- [return]F12: Returns to the previous menu.

[Error Scale Offset]F9: Displays the offset menu to rotate the constellation display and the error circles to the I and Q axes.

- [0°]F7: Sets the display angle to 0° (initial value).
- [22.5°]F8: Rotates the display by 22.5°.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

2nd page (when a Vector Error, Phase Error, or Magnitude Error waveform is displayed)

[Vertical Scale]F7: Displays the vertical scale menu.

(Vector Error, Magnitude Error)

- [5%]F7: Displays the 5% scale.
- [10%]F8: Displays the 10% scale.
- [20%]F9: Displays the 20% scale.
- [50%]F10: Displays the 50% scale.
- [100%]F11: Displays the 100% scale.
- [return]F12: Returns to the previous menu.

(Phase Error)

- [5deg.]F7: Displays the 5-degree scale.
- [10deg.]F8: Displays the 10-degree scale.
- [20deg.]F9: Displays the 20-degree scale.
- [50deg.]F10: Displays the 50-degree scale.
- [100deg.]F11: Displays the 100-degree scale.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

(4) Power measurement: RF Power screen, Setup Template screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure the RF power of the send signal from the transmitter.

For the burst signal measurement, the template (magnitude standard line) of the RF power waveform can be set (on Setup Template screen). One hundred types of templates can be saved on floppy disk (3.5-inch) (on Save Template screen) and recalled (on Recall Template screen).

Note that a template can be displayed only when a relative level mode is set at burst signal measurement.

Note: On the RF Power screen, the power sensor is not used; the internal IF level is used to measure the power.

(a) Measuring the power: RF Power screen

- Display the RF Power screens according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[RF Power]F9	Displays the RF Power screen. The first page of the RF Power menu appears.

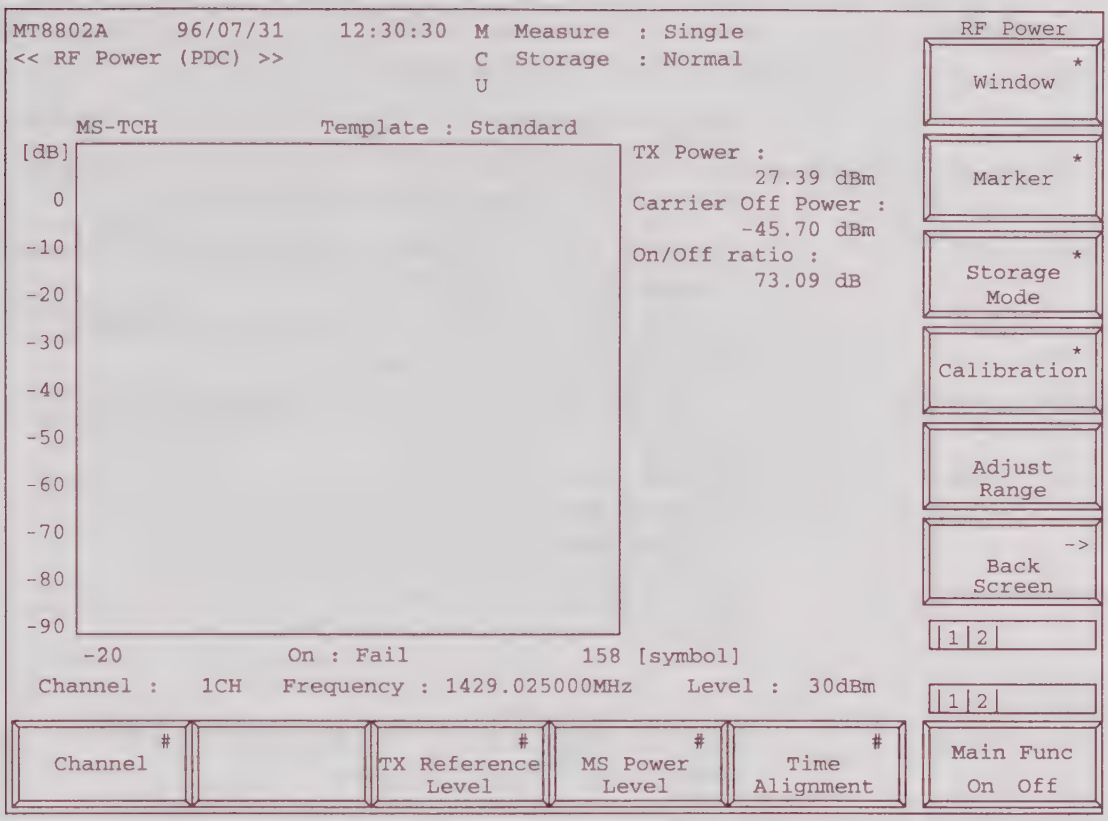
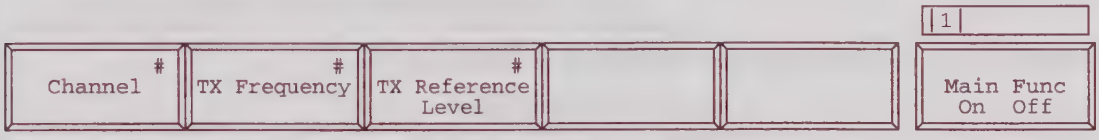


Fig. 4-14 RF Power Screen

The 2nd page of the main function keys on the TX mesurement screen (DUT Control: Call Proc)

The main function keys on the TX mesurement screen (DUT Control: None)



Notes: • When measuring the burst signal while the relative level of the magnitude measurement waveform is displayed, a template (magnitude standard line) can also be displayed.

• TX Power: Displays the average power in the burst.

Carrier Off Power: Displays an average power when transmission is not performed. Carrier Off Power is displayed when the burst signal is measured.

• Main function keys

1st page

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3 — Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5 — Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3 — Changes the reception level of MS (output level from the MT8802A).
Disappears when DUT Control is None.

• Function keys:

1st page

[Window]F7: — Displays a waveform-window setup menu.

- [Slot]F7: — Displays a waveform corresponding to one slot.
- [Frame]F8: — Displays a waveform corresponding to one frame.
- [Leading]F9: — Displays a waveform at the leading edge of the burst signal.
- [Trailing]F10: — Displays a waveform at the trailing edge of the burst signal.
- [return]F12: — Returns to the previous menu.

[Marker]F8: — Displays the Marker menu.
If this key is pressed when Off is selected, Normal is selected.

- [Normal]F7: — Sets normal marker mode. Enters the marker-position input wait status.
  Range: Lower limit to upper limit of horizontal display scale (unit: symbol)
  Resolution: 0.1 symbol
  Initial value: Center of the screen
- [Off]F8: — Sets marker mode to off and clear the marker (initial value).
- [return]F12: — Returns to the previous menu.

[Storage Mode]F9: Displays the storage mode setup menu.
Either of the following items can be selected:

1st page

[Normal]F7: Displays the normal waveform storage mode setup menu.

[Average]F8: Sets averaging mode.
Measure mode is set to Single.

[Average Count]F9: Sets the averaging count.
2 to 9,999, Resolution: 1, Initial value: 10

[Wide Dynamic Range]F11: Increases the vertical axis display range by 20 dB to make it 120 dB.
Measure mode is set to Single.
This item can be selected when RF Input is set to MAIN on the Instrument Setup screen and the measurement signal is a burst signal with a synchronous word.

[return]F12: Returns to the previous menu.

2nd page

[Max Hold]F7: Compares new and old waveform data items each time a measurement is performed, and displays the larger data item. (Maximum value holding)

[Min Hold]F8: Compares new and old data items each time a measurement is performed, and displays the smaller data item. (Minimum value holding)

[Cumulative]F9: Sets waveform dot data accumulation display mode.

[Over Write]F10: Sets the waveform overwriting mode.

[return]F12: Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

[Manual Calibration]F7: Performs level calibration.
During calibration, the window indicating calibration in progress is displayed on the screen.

[Calibration Cancel]F8: Deletes level calibration data.

[return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals.
(See paragraph 4.3.1 (2))

[Back Screen]F12: Displays the previous screen.

2nd page

[Recall Template]F7: Displays the template calling menu. (Para. 4.3.9)
This function key is only valid when the burst signal is measured and a relative level is displayed.

[Setup Template]F8: Displays the template setup (Setup Template) screen.
(See paragraph 4.3.6, (4), (b).)

[Unit]F9: Displays the power measurement unit menu.

- [dBm]F7: Sets the power measurement value unit to dBm (initial value)
- [nW/μW/mW/W]F8: Switches the power measurement value unit to the watt system.
- [return]F12: Returns to the previous menu.

[Level Rel./Abs.]F10: Displays the menu for selecting absolute or relative display of the waveform vertical axis scale.

- [Relative]F7: Sets the waveform vertical axis scale to relative display (dB).
This function key displays a relative value from the average power at burst-on (initial value).
- [Absolute]F8: Sets the waveform vertical scale to absolute display (dBm).
No template is displayed.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

(b) Setting the template: Setup Template screen

- Display the Setup Template according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[RF Power]F9	Displays the RF Power screen. The first page of the RF Power menu appears.
5.	Next Menu [▲]	Displays the second page of the RF Power menu.
6.	[Setup Template]F8	Displays the Setup Template screen.

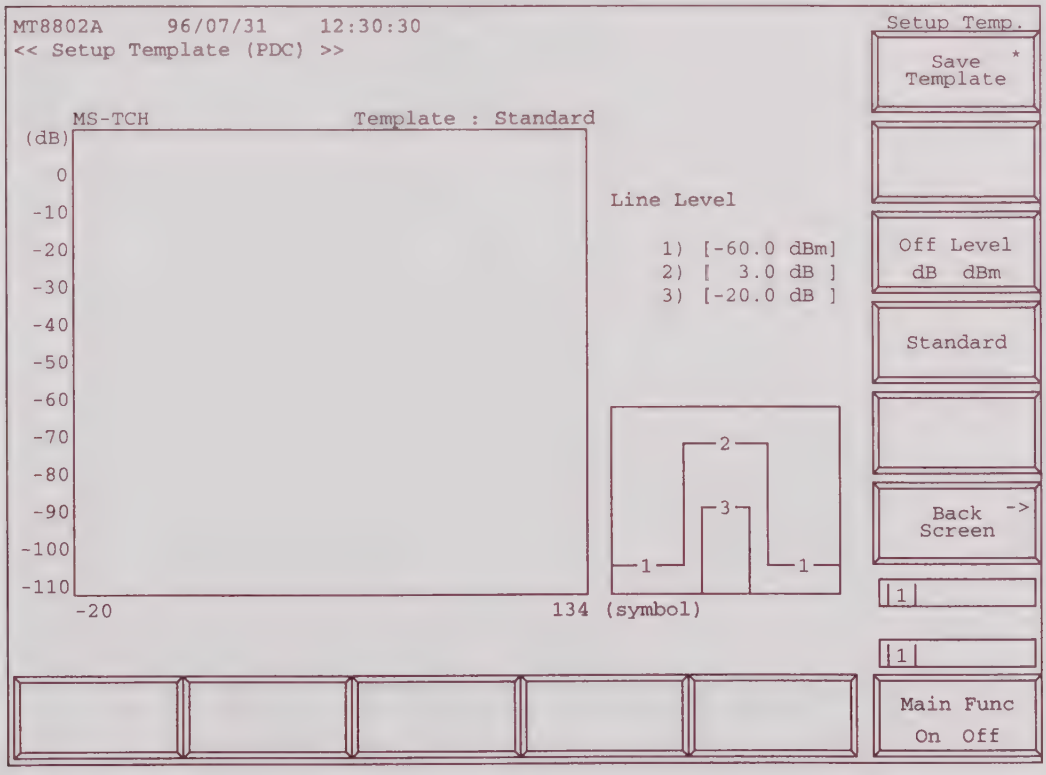
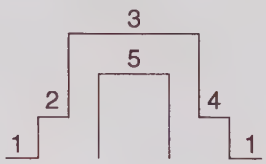
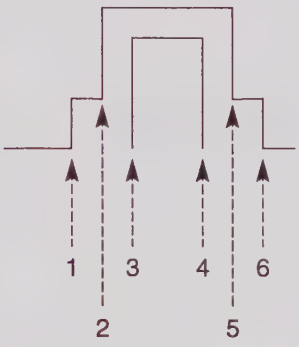


Fig. 4-15 Setup Template Screen (Standard)

Note: When the template to be called is modified, the template name becomes "Not Selected" indicating that the template is not saved in internal memory.

- Standard template

Standard patterns (fixed)	(LIMIT-1)	–70dB	
	(LIMIT-2)	–60dB	
	(LIMIT-3)	4dB	
	(LIMIT-4)	–60dB	
	(LIMIT-5)	–14dB	
MS-TCH Symbol positions (RCR STD-27 B : fixed)	1	– 2 symbol	
	2	– 0.5 symbol	
	3	2 symbol	
	4	137 symbol	
	5	139.5 symbol	
	6	141 symbol	
MS-TCH Symbol positions (RCR STD-27 C : fixed)	1	– 2.5 symbol	
	2	– 1 symbol	
	3	2 symbol	
	4	136 symbol	
	5	139 symbol	
	6	140.5 symbol	

- Set the following items on the Setup Template screen.

Item	Range	Resolution	Initial value
Line Level			
1	-110.0 to 10.0 dB/dBm	0.1 dB	standard value
2	-110.0 to 10.0 dB	0.1 dB	standard value
3	-110.0 to 10.0 dB	0.1 dB	standard value
4	-110.0 to 10.0 dB	0.1 dB	standard value
5	-110.0 to 10.0 dB	0.1 dB	standard value

- Function keys

Main function key: None

Function keys:

[Save Template]F7: Display the template save menu. (Para. 4.3.9)

[Off Level dB dBm]F9: Selects a template level-1 unit (dB or dBm). (Initial value: dB)

[Standard]F10: Sets the standard template.

[Back Screen]F12: Displays the previous screen.

(5) Measuring the occupied frequency bandwidth: Occupied Bandwidth screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.4, (1), (a)) to measure an occupied frequency bandwidth of a send signal from the transmitter.

- Display the Occupied Bandwidth screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[Occupied Bandwidth]F10	Displays the Occupied Bandwidth screen.

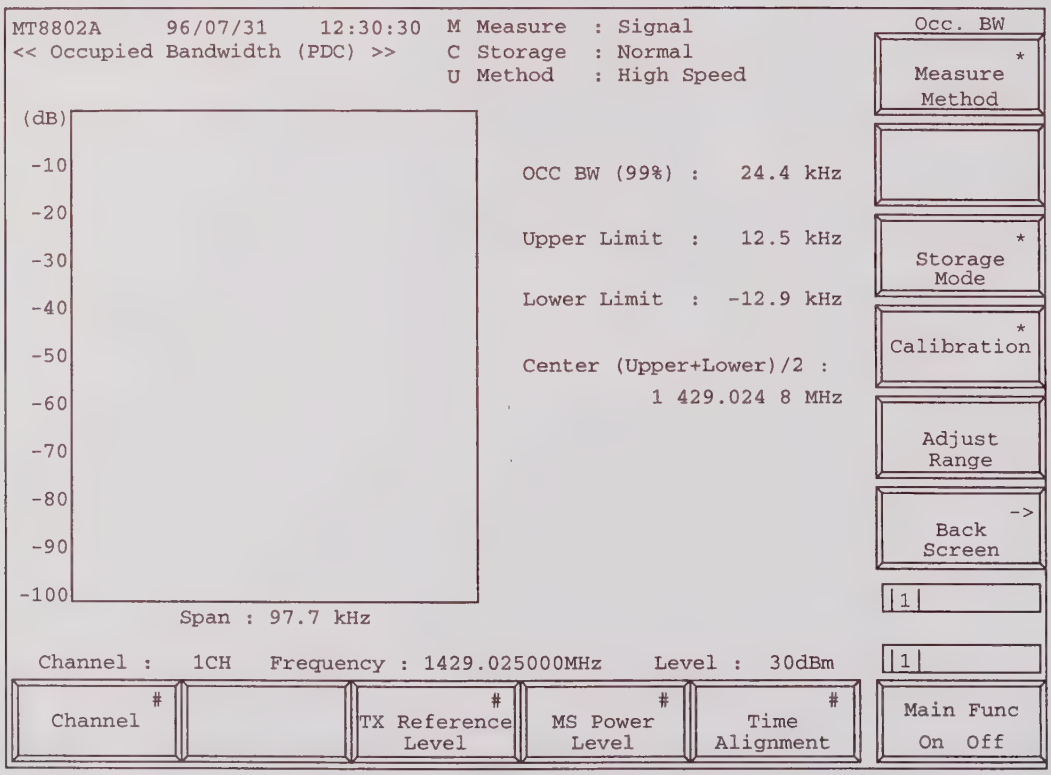


Fig. 4-16 Occupied Bandwidth Screen

The 2nd page of the main function keys on the TX mesurement screen (DUT Control: Call Proc)

The main function keys on the TX mesurement screen (DUT Control: None)

Notes:
- A spectrum measurement waveform is displayed in the window.
- The vertical axis scale is fixed to 0 to -100 dB.
- The reference level is that set on the Setup Common Parameter screen. If the set level is significantly different from the input signal level, use the [Adjust Range] (F11) key to make it appropriate, then measure the occupied frequency bandwidth.

- Main function keys

1st page

[Channel]F1: Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2: Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3: Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4: Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5: Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3: Changes the reception level of MS (output level from the MT8802A).
Disappears when DUT Control is None.

- Function keys:

[Measure Method]F7:	Displays the measurement method (99% method) selection menu. *1
[Spectrum]F7:	Measures the occupied frequency bandwidth by using the spectrum analyzer method. Disappears when DUT Control is Call Proc.
[High Speed]F8:	Measures the occupied frequency bandwidth at high speed by using the fast Fourier transform (FFT) method.
[return]F12:	Returns to the previous menu.
[Storage Mode]F9:	Displays the storage mode setup menu.
[Normal]F7:	Sets normal mode (initial value).
[Average]F8:	Sets averaging mode. The Measure mode is set to Single.
[Average Count]F9:	Sets the averaging count. 2 to 9999, Resolution: 1, Initial value: 10
[return]F12:	Returns to the previous menu.
[Calibration]F10:	Displays the level calibration menu.
[Manual Calibration]F7:	Performs level calibration. During calibration, the window indicating that calibration in progress is displayed on the screen.
[Calibration Cancel]F8:	Deletes the level calibration data.
[return]F12:	Returns to the previous menu.
[Adjust Range]F11:	Sets the measurement level range (RF power meter range and reference level) to the status appropriate for measurement signals. (See paragraph 4.3.1 (2))
[Back Screen]F12:	Displays the previous screen.

*1: When DUT Control is Call Processing, Measure Method becomes High Speed.

(6) Measuring the adjacent channel leakage power: Adjacent Channel Power screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure the adjacent channel leakage power of a send signal from the transmitter.

- Display the Adjacent Channel Power screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[Adjacent Channel Power]F11	Displays the Adjacent Channel Power screen.

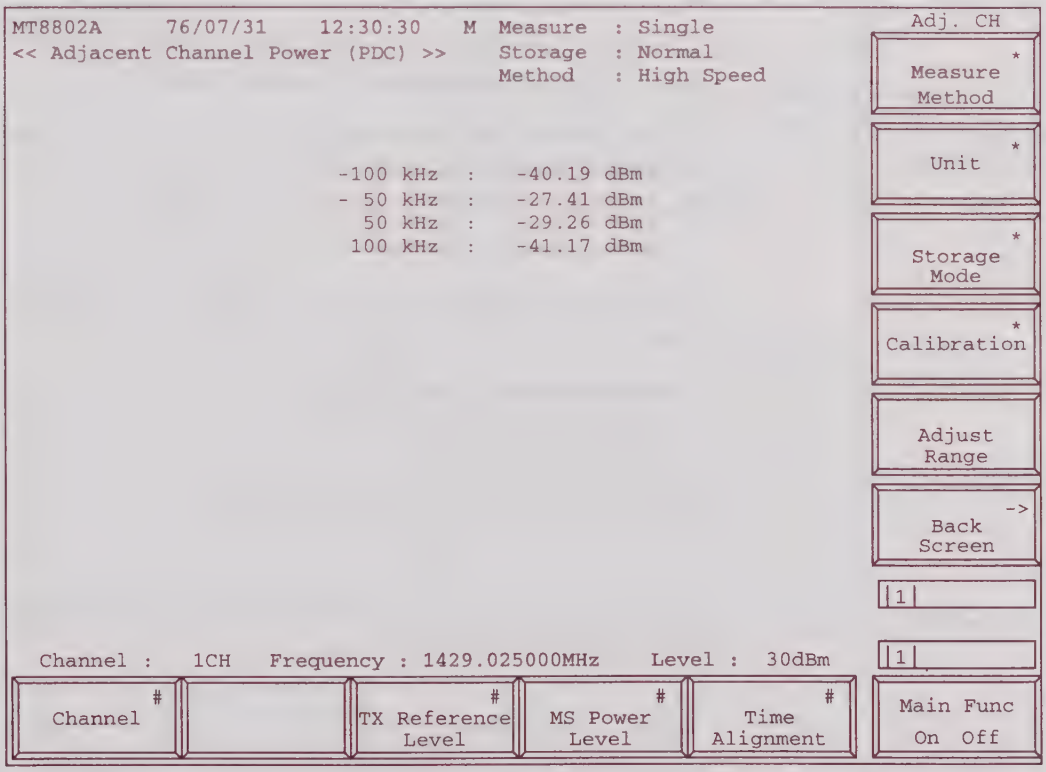
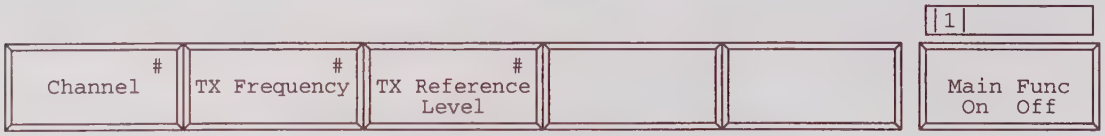


Fig. 4-17 Adjacent Channel Power Screen

The 2nd page of the main function keys on the TX mesurement screen (DUT Control: Call Proc)

The main function keys on the TX mesurement screen (DUT Control: None)



- Main function keys

1st page

[Channel]F1: Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2: Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3: Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4: Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5: Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3: Changes the reception level of MS (output level from the MT8802A).
Disappears when DUT Control is None.

Function keys:

[Measure Method]F7: Displays the measurement method selection menu. *1

[Spectrum(All)]F7: Measures the adjacent channel leakage power by using the spectrum analyzer.
The frequency bandwidth of five channels (including the next adjacent channel) is measured with one sweep.
Disappears when DUT Control is Call Proc.

[Spectrum(Separate)]F8: Measures the channel leakage power is measured using the spectrum analyzer.
The frequency bandwidth of one channel is measured with one sweep.
Disappears when DUT Control is Call Proc.

[High Speed]F9: Measures the channel leakage power at high speed using digital signal processing (initial value).

[Measure On, Off]F10: • Marker
Selects Marker On or Off. (Initial value: Off)
When On is selected, the marker is displayed and the screen enters the marker position (offset frequency) input wait state.
The leakage power is integrated by the specified band width (PDC:21 kHz) at the center marker position and displayed as a ratio (dB) to the carrier.

[return]F12: Returns to the previous menu.

[Unit]F8: Displays the power measurement value unit menu.

[dBm]F7: Sets the power measurement value unit to dBm (initial value).

[mW]F8: Sets the power measurement value unit to mW.

[μW]F9: Sets the power measurement value unit to μW.

[nW]F10: Sets the power measurement value unit to nW.

[dB]F11: Sets the power measurement value unit to dB.
The power is displayed with a relative value from the carrier signal level in the burst signal.

[return]F12: Returns to the previous menu.

[Storage Mode]F9: Displays the storage mode setting menu.

[Normal]F7: Sets normal mode.

[Average]F8: Sets averaging mode.
Measure mode is set to Single.

[Average Count]F9: Sets the averaging count.
2 to 9999, Resolution: 1, Initial value: 10
This item can be set even if averaging mode is set to Off.

[return]F12: Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

- [Manual Calibration]F7: Performs level calibration. During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: Deletes the level calibration data.
- [return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals. (See paragraph 4.3.1 (2))

[Back Screen]F12: Displays the previous screen.

*1: When DUT Control is Call Processing, Measure Method becomes High Speed.

(7) Power meter: Power Meter screen

Use the power sensor to measure the average power on the Power Meter screen.

• Display the Power Meter screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Test mode. The Setup Common Parameter screen appears.
3.	[TX Measure]F1	Displays the first page of the TX Measure menu.
4.	[Power Meter]F12	Displays the Power Meter screen.

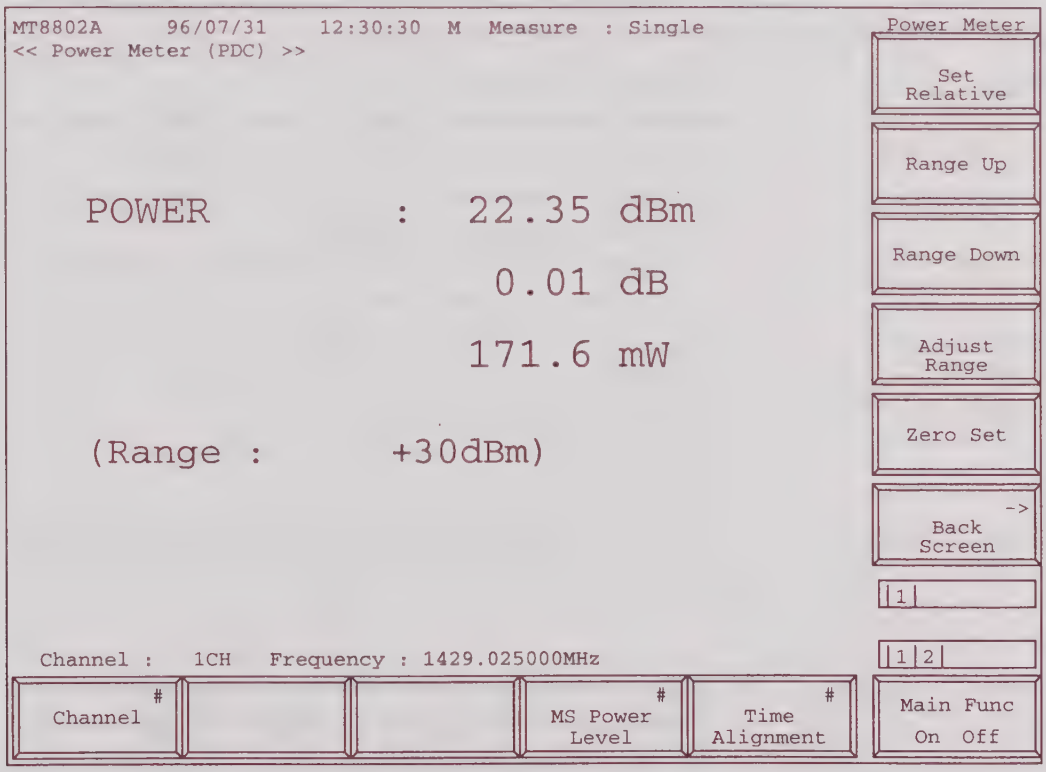
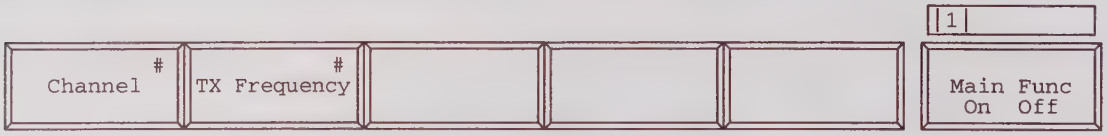


Fig. 4-18 Power Meter Screen

The 2nd page of the main function keys on the TX mesurement screen (DUT Control: Call Proc)

The main function keys on the TX mesurement screen (DUT Control: None)



Note: The measured resultes are displayed in units of dBm/dB (relative display)/W in this order.

- Main function keys

1st page

[Channel]F1: Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2: Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[MS Power Level]F4: Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5: Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Level]F3: Changes the reception level of MS (output level from the MT8802A).
Disappears when DUT Control is None.

- Function keys:

[Set Relative]F7: Enables to display the power measurement result using a relative value. The reference value is the power measurement value immediately before setting the relative value display.
If the Power Meter screen is switched to another screen or the power is turned off, the screen enters absolute value display mode and the set reference value is invalid.

[Range Up]F8: Increases the measurement range.

[Adjust Range]F10: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal.
(See paragraph 4.3.1, (2))

[Zero Set]F11: Adjusts zero-point of the power meter, as described below.

[Back Screen]F12: Displays the previous screen.

• Power meter zero calibration

To make accurate RF power measurement in transmitter measurement (TX Measure mode), calibrate the zero position of the power meter as described below.

Step	Key operation	Description
1.		Remove any signal input to the RF input connector (Main).
2.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
3.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Power Meter]F12	Displays the Power Meter screen.
6.	[Zero Set]F11	Zero-calibrates the power meter. During zero calibration, the window indicating that calibration is being performed is displayed on the screen.
7.	[Back Screen]F12	Returns to the Setup Common Parameter screen.

(8) Transmission measurement example

An example of transmission measurement (modulation analysis) using the mobile station of PDC as the measured equipment is given below.

1. Setup

As described in paragraph 4.3.1 (1) (a), "Setting the transmitter (TX Measure)," connect the MT8802A to the measured equipment (mobile station).

2. Setting and measurement procedures

Perform transmission measurement (modulation analysis) as described below.

Step	Operation

(Checking and setting the measurement interface)

1. Press function key F6 (Main Function) to display the main functions.
2. Press the Next Menu key [◀] and function key F2 (Instrument Setup) in this order to switch to the Instrument Setup screen.
3. Check that the RF Input/Output item is set to Main. If necessary, change the set value (Note 1).
4. Press function key F6 (Main Function) to display the main functions.
5. Press function key F1 (TX/RX Measure) to enter TX/RX Measure mode (Setup Common Parameter screen).

(Setting the Setup Common Parameter screen)

6. Set DUT Controlto None.
7. Set a measurement frequency or measurement frequency channel.

   (Example: Set Band of Traffic Channel to 800 MHz-1, and Channel to 1 CH.)
8. Set a measurement level (TX Measure Ref Level).
9. Set Signal items for the type of measurement object signal.
   - Measuring Object: Set MS-TCH (up-link communication channel). (Note 2)
   - Channel per Carrier: Select Full rate or Half rate in accordance with the output burst signal period of the mobile station.
   - Set a Sync word (synchronous word) pattern. If necessary, change this value (Note 3).

(Setting the Setup TX Parameter screen)

10. Press function key F1 (TX Measure) to enter TX measurement mode.
11. Press the Next Menu key [▲] and function key F9 (Setup TX Parameter) in this order to switch to the Setup TX Parameter screen.
12. RCR-STD27: Specify a measurement range in the burst. Set "C" here.
13. If necessary, set User Cal Factor. For details of the contents and steps, see paragraph 4.3.1 (3).

(Setting the Modulation Analysis screen and measurement)

14. Press function key F12 (Back Screen) to return to the Setup Common Parameter screen temporarily.
15. Press the Next Menu key [▲] and function key F8 (Modulation Analysis) in this order to switch to the Modulation Analysis screen.
16. Operate the measured equipment to output up-link stationary burst signals.

17. Press function key F11 (Adjust Range) to optimize the measurement range.
18. If the Single or Continuous key is pressed after terminating the optimization, the modulation precision is measured and the result is displayed.
19. If function key F9 (Storage Mode) is pressed, the function keys for measurement mode selection are displayed. The Normal measurement mode (Normal) or average measurement mode (Average) can be selected. If the Single or Continuous key is pressed after the setting, the modulation precision is measured again.

Notes 1: Use the Main RF signal connector to the measured equipment unless the lower limit of the level range is exceeded.

2: Set this value to the same value as that of the measured equipment. The transmitter tester of the MT8802A measures up-link signals output by the mobile station (MS) (correspond to signals output by the measured object).

3: Set this value in accordance with the synchronous word of the signal output from the measured equipment.

3. Notes on transmission measurement

Note the followings when measuring the transmission:

3.1 Output Signal period of the Measured Equipment

Output transmission output signals from the measured equipment periodically as close to the frame (subframe) timings as possible. Fix the transmission level and synchronous word of the modulation data. The following measurements and operations are performed assuming that the transmission output signals are output periodically and are stationary:

- Adjust Range operation
- Manual Calibration operation
- Average mode measurement
- Spectrum mode measurement of occupied frequency bandwidth and adjacent channel leakage power measurements

4.3.7 Receiver test: RX Measure mode

This paragraph describes how to set parameters (Setup RX Measure Parameter) and measure the bit error rate (on Bit Error Rate screen).

(1) Setting parameters: Setup RX Measure Parameter screen

The following describes how to set parameters (Setup RX Measure Parameter screen) when conducting the receiver test (RX Measure mode).

- Display the Setup RX Measure Parameter according to the following steps, then set the RX parameters.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[RX Measure]F2	Displays the RX Measure menu.
4.	Next Menu[▲]	Displays the 2nd page of the RX Measure menu.
5.	[Setup RX Parameter]F8	Displays the Setup RX Measure Parameter screen.

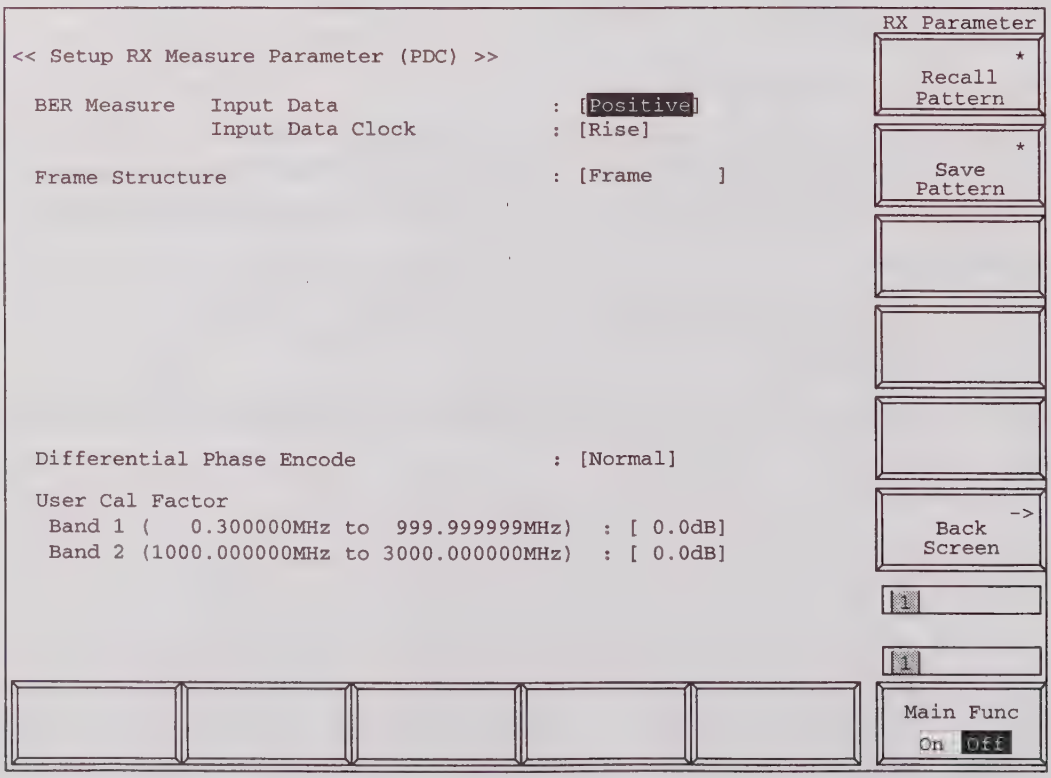


Fig. 4-19 Setup RX Measure Parameter Screen

• Set the following items:

Item	Range	Resolution	Initial value
BER Measure			
Input Data			
	Positive, Negative		Positive
Input Data Clock			
	Rise, Fall		Rise
Frame Structure			
	Frame, Super Frame		Frame
Differential Phase Encode			
	Normal, Invert		Normal
User Cal Factor (User level calibration value)			
	–55dB to 55dB	0.1dB	0.0dB

Note: Frame Structure,Differential Phase Encode are not displayed when DUT Control is Call Proc.

• Function keys

Main function key: None

Function keys:

[Recall Pattern]F7: Displays the output pattern calling menu. (Para. 4.3.9)

[File No.]F9: Opens the window for entering the calling position (number) of the pattern data file.
0 to 99, Resolution: 1, Initial value: 0

[return]F12: Returns to the previous menu.

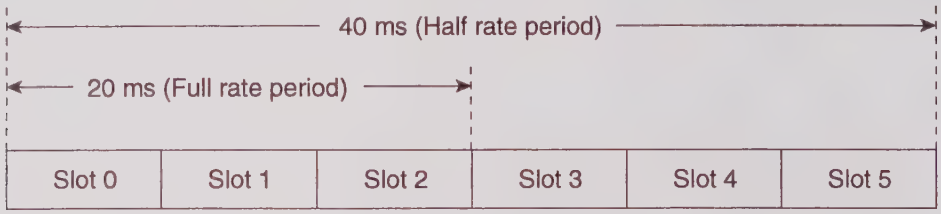
[Save Pattern]F8: Displays the output pattern saving menu. (Para. 4.3.9)

[Back Screen]F12: Displays the previous screen

• Modulation Data

1.1 Frame structure

The PDC system uses the TDMA frame consisting of three slots at the Full rate and six slots in the Half rate. The MT8802A uses this frame as the period to generate data (modulation signal).
The PN9/PN15-stage pseudo-random pattern in a selected TCH burst data has continuity.



1.2 Slot signal configuration

The MT8802A uses slot signals listed below.

(1) Up-link communication channel

TX measurement: Input signal when Measuring Object is set to MS-TCH

Up-link communication channel

R	P	TCH	SW	CC	SF	SACCH	TCH	G
4	2	112	20	8	1	15	112	6

R : Burst transient response guard time: ..... 0_H (4 bits)
P : Pre-amble: ..... 2_H (2 bits)
TCH : User imformation transmission: ..... PN9-stage pseudo random pattern independent in each slot
(The PN pattern has continuity in TCH of the same slot.)
SW : Sync word ..... Slot 0 = $785B4_H$ (20 bits)
Slot 1 = $62DC9_H$ (20 bits)
Slot 2 = $7E28A_H$ (20 bits)
Slot 3 = $56B15_H$ (20 bits)
Slot 4 = $AE9B3_H$ (20 bits)
Slot 5 = $B2621_H$ (20 bits)
CC : Color code: ..... 00_H (8 bits)
SF : Steal flag: ..... 0_H (1 bits)
SACCH : Slow-accompanied control channel : ..... 0000_H (15 bits)
G : Burst transient response guard time: ..... 00_H (6 bits)
Scramble functions (TCH, SF, SACCH) : ..... On
Scramble code : ..... 000_H (9 bits)
[Setup parameters]
- CC : 00_H to FF_H (8 bits)
- TCH : PN9 or PN15-stage pseudo random pattern
- Scramble function : On/Off
- Scramble code : 000_H to $0FF_H$ (9 bits)
- SW : S1, S2, S3, S4, S5, S6

(2) Down-link communication channel

RX measurement: Output signal when Measuring Object is set to MS-TCH

Down-link communication channel

R	P	TCH	SW	CC	SF	SACCH	TCH
4	2	112	20	8	1	21	112

R : Burst transient response guard time: ..... 0_H (4 bits)
P : Pre-amble: ..... 2_H (2 bits)
TCH : User imformation transmission: ..... PN9-stage pseudo random pattern independent in each slot
(The PN pattern has continuity in TCH of the same slot.)
SW : Sync word ..... Slot 0 = $87A4B_H$ (20 bits)
Slot 1 = $9D236_H$ (20 bits)
Slot 2 = $81D75_H$ (20 bits)
Slot 3 = $A94EA_H$ (20 bits)
Slot 4 = $5164C_H$ (20 bits)
Slot 5 = $4D9DE_H$ (20 bits)
CC : Color code: ..... 00_H (8 bits)
SF : Steal flag: ..... 0_H (1 bits)
SACCH : Slow-accompanied control channel : ..... 000000_H (21 bits)
Scramble functions (TCH, SF, SACCH) : ..... On
Scramble code : ..... 000_H (9 bits)
[Setup parameters]

- CC : 00_H to FF_H (8 bits)
- TCH : PN9 or PN15-stage pseudo random pattern
- Scramble function : On/Off
- Scramble code : 000_H to $0FF_H$ (9 bits)
- SW : S1, S2, S3, S4, S5, S6

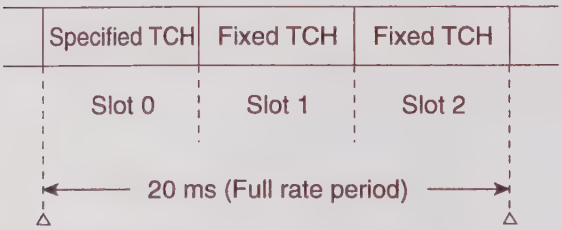
1.3 Modulation data

The PDC system changes the modulation data according to the Measuring Object.
In the figures below, the triangle mark Δ indicates the trigger timing.

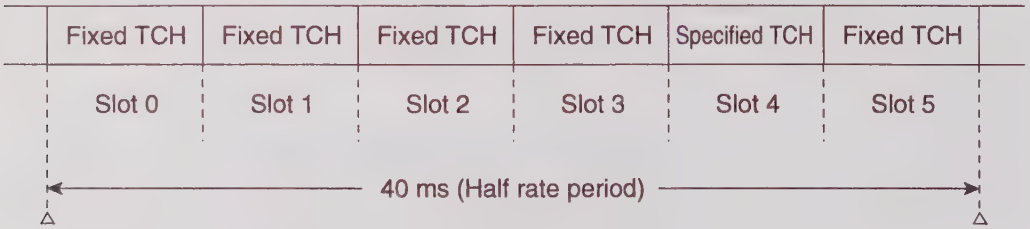
(1) MS-TCH

The signal to be measured is the down-link communication channel. The slot location specified with Slot is the down-link communication channel that contains the PN9/PN15 data signal having continuity between frames. Other slots contain the fixed data of the down-link communication channel format as specified in the PDC Standards.

Example 1: Full rate signal in slot 0



Example 2: Half rate signal in slot 4



(2) Continuous

The signal to be measured is the continuous signal. Select either of PN9, PN15 or 4-bit period data. Continuous signal is regardless to the time of frames and slots above.

• Differential Phase Encode Function

This function inverts the direction of phase change against modulation data, changing the differential phase encoding specification at the π/4DQPSK modulation. With this function, the right and left of modulation spectrum can be inverted with the carrier frequency as the center. The differential phase encoding specifications are shown in the table below.

Data XY	Differential Phase Encode	
	Normal	Inverse
11	$-3\pi/4$	$3\pi/4$
01	$3\pi/4$	$-3\pi/4$
00	$\pi/4$	$-\pi/4$
10	$-\pi/4$	$\pi/4$

Caution: X and Y represent symbols composed of 2 bits each. X advances to Y timewise.

(2) Measuring the bit error rate: Bit Error Rate screen

The following describes how to measure the bit error rate (on Bit Error Rate screen) of the receiver by using the parameters set on the Setup RX Measure Parameter screen (see paragraph 4.3.7, (1)).

Some set items can be changed by using the function keys.

- Display the Bit Error Rate screen according to the following steps to measure the bit error rate.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	[RX Measure]F2	Displays the RX Measure menu.
4.	[Bit Error Rate]F7	Displays the Bit Error Rate screen.
5.	[Measure]F1 [Frequency]F2 [Level]F3	Displays the Measure menu. Displays the Frequency menu. Displays the Level menu.

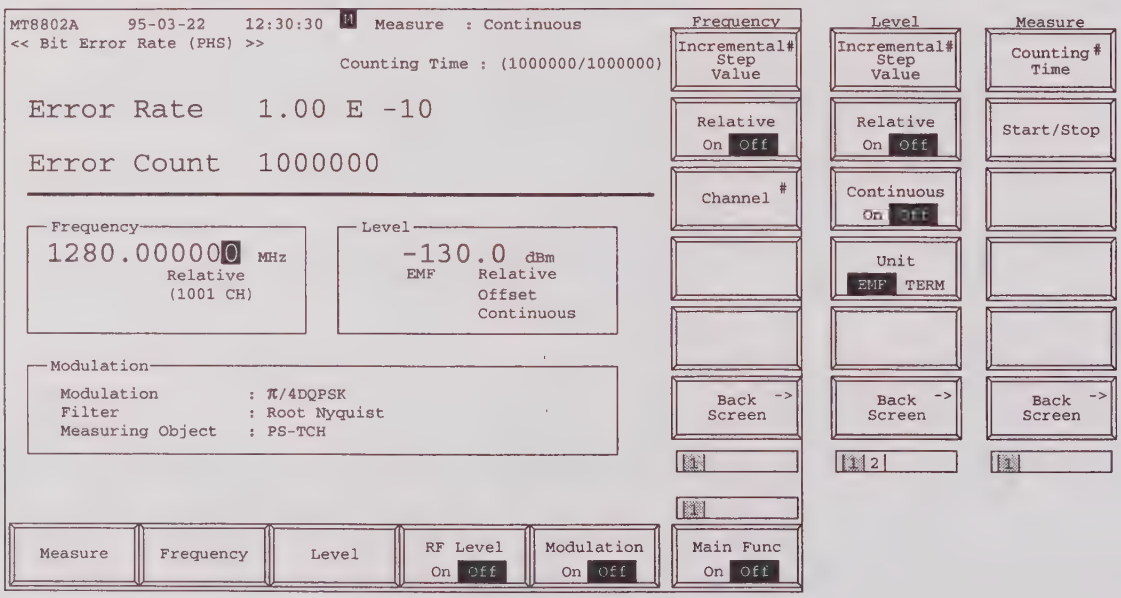
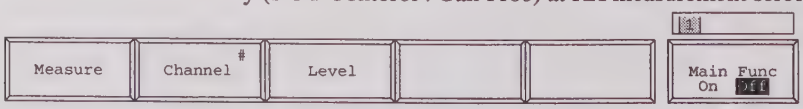


Fig. 4-20 Bit Error Rate screen

The main function key (DUT Contorol : Call Proc) at RX measurement screen



Notes: 1. If synchronization failure occurs at start of or during measurement, Sync Loss is displayed. In this case, measurement stops until synchronization is established. When synchronization is established, measurement starts.

2. When the Measure mode is set to Single:
The intermediate measurement result is updated and displayed. When the number of data items reaches the specified number, measurement terminates.

When Measure mode is set to Continuous:
If Counting Time is not set to Infinite, the measurement result is updated when measurement of the specified number of data items terminates. Measurement is then restarted.
If Counting Time is set to Infinite, the half-way measurement result is updated and displayed.

- Function keys

Main function keys:

[Measure]F1: Displays the Measure menu on F7 to F12.

[Frequency]F2: The output frequency setup menu appears on F7 to F12.

[Level]F3: The output level setup menu appears on F7 to F12.

[RF Level On Off]F4: Sets the output level On or Off. Initial value: Off

[Modulation On Off]F5: Sets Modulation On or Off. Initial value: Off

Function keys:

--- Measure menu ---

[Counting Time]F7: Sets the measurement time (number of data bits).

Range: –1 (∞) to 99999999
Resolution: 1
Initial value: 10000

[Start/Stop]F8: Starts (restarts) or stops measurement.

[Back Screen]F12: Displays the previous screen.

-- Frequency menu ---

[Incremental Step Value]F7: Sets a step value when incrementing or decrementing an output frequency value by using the Step keys.

Range: 1 Hz to 3 GHz
Resolution: 1 Hz
Initial value: 1 MHz

[Relative On Off]F8: Displays the relative output frequency based on the reference value immediately before setting Relative On.

Range: On, Off Initial value: Off

Note: If a frequency is set using a numeric key when this item is On, the value becomes the real output frequency.
Relative display value =
Value set by numeric key - Value before setting On

[Channel]F9: Sets the channel number.

[Back Screen]F12: Displays the previous screen.

--- Level menu ---

1st page

[Incremental Step Value]F7: Sets a step value when incrementing or decrementing an output level by using the Step keys.

Range: 0.1 to 80 dB
Resolution: 0.1 dB
Initial value: 1 dB

[Relative On Off]F8: Displays a relative output level based on the reference value (dB unit) immediately before setting Relative On.

Range: On, Off Initial value: Off

Note: If a level is set using a numeric key when this item is set On, the value becomes the real output level.
Relative display value =
Value set using a numeric key - Value before setting On

[Continuous On Off]F9: Sets a mode in which an output level can be changed without an interrupt in the range of 20 dB. If a value immediately before setting Continuous On is assumed to be L0 dBm, the level can be changed by using the rotary knob without an interrupt in the range of 20 dB. (The Step and numeric keys are invalid.)

(L0 - 20) dBm ≤ Output level ≤ L0 dBm

[Unit EMF TERM]F10: Selects an open voltage (EMF, dBμ)/terminating voltage (TERM, dBμ) unit.
30 dBμ EMF = 24 dBμ TERM
This key is displayed when Level display unit is set to dBμ.

[Back Screen]F12: Displays the previous screen.

2nd page

[Offset Value]F7: Sets an offset value in output level offset display mode. The loss in the RF cable connecting the MT8802A and receiver under test can be corrected by using this key. (See paragraph 4.3.1, (4).)

Range: -55.0 to 55.0 dB
Resolution: 0.1 dB
Initial value: 0 dB

[Offset On Off]F8: Increases or decreases the real output level to display.
Displayed value = Real output level value + Offset value

Range: On, Off Initial value: Off

Note: If a level is set using a numeric key when this item is On, the value becomes the displayed value.
Real output level value = Displayed value - Offset value

[Back Screen]F12: Displays the previous screen.

• Input signals for BER Measurement

This paragraph describes the input signals used to measure BER(Bit Error Rate, receive sensitivity) of the receiver using RX Measure function.

The MT8802A has the BER input connectors in two locations.

1. BER connectors on the rear panel (See para. (a).)
2. DUT Interface connector on the front panel (See para. (b).)

Note: The BER measurement uses either of the BER connectors on the rear panel or the DUT Interface connector on the front panel.
Do not input signals to both of them at a time. (Leave either of them disconnected or not wired.)

(a) BER measurement connectors on rear panel

The MT8802A has the BER connectors on the upper left of the rear panel.

i) BER Input Data

BER-measurement data input connector.
BER-measurement serial data is input from the receiver.

Input level: TTL level
Input waveform: See para. (c).

ii) BER Input Data Clock

BER-measurement data-clock input connector.
BER-measurement serial-data timing clock is input from the receiver.

Input level: TTL level
Input waveform: See para. (c).

(b) BER-measurement DUT Interface connector on front panel

The MT8802A has the DUT Interface connector on the front panel.

Note: When entering a signal from this connector, be sure to connect the GND terminals (1-pin or 7-pin) to ground.

i) BDAT_INBER (pin 22)

BER-measurement data input terminal. Similar to the BER Input Data connector on the rear panel, BER-measurement serial data is input from the receiver.

Input level: TTL level
Input waveform: See para. (c).

ii) BCLK_IN terminal (pin 21)

BER-measurement data clock input terminal. Similar to the BER Input Data Clock on the rear panel, BER-measurement serial-data timing clock is input from the receiver.

Input level: TTL level
Input waveform: See para. (c).

(c) Input signals for BER measurement

This paragraph describes the BER measurement signals which are input to the BER connectors or DUT Interface connector described in paragraphs (a) and (b).

a) BER Input Data, BDAT_INBER

- Measurement signal

  This input signal is PN data (PN9/PN15-stage pseudo random pattern) demodulated by the receiver. When communication burst (CS-TCH or PS-TCH) is used for BER measurement, extract the PN data in the TCH area, then output it to the MT8802A.

- Signal polarity

  The polarity of input signal may be positive or negative logic. However, match the interface of the MT8802A to the polarity of input signal used, as described below.

  Setup item: BER Measure Input Data in the Setup RX Parameter screen
  Set [Positive] for the positive logic (same logic as the modulation signal).
  Set [Negative] for the negative logic (inverted logic to the modulation signal) .

b) BER Input Data Clock, BCLK_IN

- Measurement signal

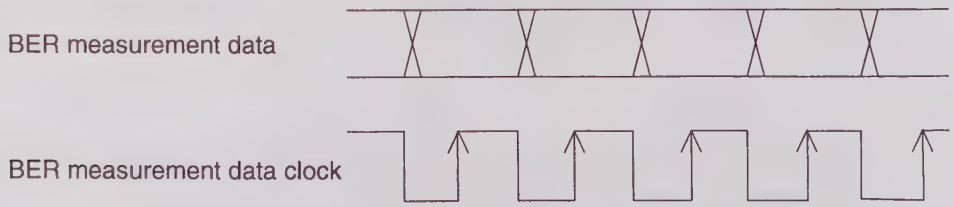
  This input signal is the data-transmission timing clock of the BER Input Data or BDAT_INBER. The clock is synchronized to the data signal in para. a). Set the data fetching timing of the MT8802A.

- Signal polarity

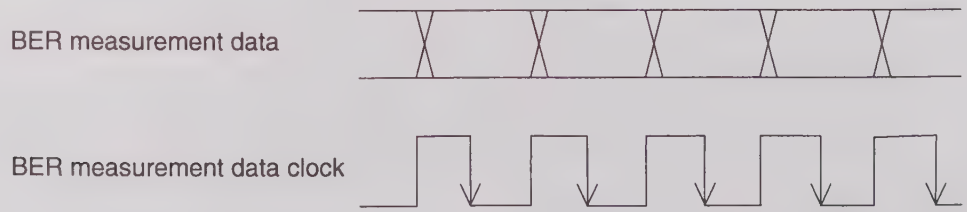
  The polarity of input signals may be rising or falling edge. However, match the interface of the MT8802A to the polarity of input signal used, as described below. (Set the data fetching timing of the MT8802A.)

  Setup item: BER Measure Input Data Clock in the Setup RX Parameter screen
  Set [Rise] for the rising edge, and [Fall] for the falling edge, as shown below.

  i) When the input signal polarity is the rising edge, set [Rise].



  ii) when the input signal polarity is the falling edge, set [Fall].



(3) Example of receiving sensitivity measurement

An example of receiving sensitivity measurement using the mobile station of PDC as measured equipment is given below.

1. Setup

As described in paragraph 4.3.1(1)(b), "Setting the transmitter (RX Measure)," connect the MT8802A to the measured equipment (mobile station).

2. Measurement Setting Procedure

Set the receiving sensitivity measurement of the MT8802A in the following steps:

Step	Operation

(Checking and setting the measurement interface)

1. Press function key F6 (Main Function) to display the main functions.
2. Press the Next Menu key [◄] and function key F2 (Instrument Setup) in this order to switch to the Instrument Setup screen.
3. Check that the RF Input/Output item is set to "Main." If necessary, change the set value (Note 1).
4. Press function key F6 (Main Function) to display the main functions.
5. Press function key F1 (TX/RX Measure) to enter TX/RX Measure mode (Setup Common Parameter screen).

(Setting the Setup Common Parameter screen)

6. Set DUT Control to None.
7. Set a measurement frequency or measurement frequency channel.

   (Example: Set Band of Traffic Channel to 800 MHz-1, and Channel to 1CH.)
8. Set a measurement level (RX Measure Output Level).
9. Set Measuring Object of Signal to MS-TCH (Note 2)
10. Set the Signal item on the center of the screen. This setting item is a modulation signal parameter of the signal generator.

(Setting the Setup RX Parameter screen)

11. Press function key F2 (RX Measure) to enter RX measurement mode.
12. Press the Next Menu key [▲] and function key F9 (Setup RX Parameter) to switch to the Setup RX Parameter screen.
13. Set the BER Measure item on the top of the screen. Set the polarity of the digital signal interface for BER measurement entered from the measured equipment as a BER Measure item.

(Setting the BER Measure screen)

14. Press function key F12 (Back Screen) to switch to the Setup Common Parameter screen.
15. Press the Next Menu key [▲] and function key F7 (BER Measure) to switch to the BER Measure screen.
16. Set both function keys F4 (RF Output On/Off) and F5 (Modulation On/Off) to On to output a modulation signal.
17. Press function key F1 (Measure) to display the function keys used to set the parameters of the BER measuring instrument.
18. Use function key F7 (Counting Time) to set the number of measurement data items.

(Measuring the receiving sensitivity)

19. Check that the measured equipment receives signals output from the signal generator and outputs data. (If the BER measurement signal is output from the measured equipment, the BER measuring instrument starts counting data items.)
20. Press the Single key to start the BER measurement.
21. When counting of the specified number of BER measurement data items terminates, the measured value is read.

Notes 1: Use the Main RF signal connector to the measured equipment unless the lower limit of the level range is exceeded.

Notes 2: Set this value to the same value as that of the measured equipment. Signals output from the MT8802A correspond to down-link signals output from the base station (BS) (correspond to signals received by the measured object).

3. Notes on receiving sensitivity measurement

Note the followings when measuring the receiving sensitivity:

3.1 Synchronization of the Measured Equipment

1) Control for the synchronization time of the measured equipment

Execute the BER measurement on the BER Measure screen. Output signals of the signal generator can be output while this screen is displayed. The BER measuring instrument starts measurement immediately after the screen is switched to the BER Measure screen. If abnormal data is output while the carrier frequency or symbol lock is gaining synchronization during demodulation of the measured equipment, the output data items may be counted as error data items. In this case, the first data during gaining synchronization is ignored and the measurement is started after data is output correctly.

3.2 Signal Loss While Changing Output Level

When the output level of the signal generator is changed, the output level is lost at the instant. So, if the output level of the signal generator is changed at the BER measurement, the measured results become erroneous because of the signal loss. Instantaneous signal-loss while changing the output level can be prevented by setting Continuous of the output level control of the MT8802A to "On."

3.3 Controlling the BER Measuring Instrument

The following keys are used to control (start, halt, or terminate) the BER measuring instrument on the front panel:

1) Single and Continuous keys

The Single or Continuous key is used to start usual measurement. When the Single or Continuous key is pressed, the BER measurement starts. When the number of data reaches the number of BER measurement data items set in [Counting time], the Single key stops the measurement automatically, or the Continuous key updates the measurement result, then restarts the measurement from the beginning. If the MT8802A enters a BER measurement state before the key is pressed, it discards measurements up to this time and starts new measurements.

2) Start/Stop key

This is the [F8] key in the Measure menu (appears when main function key Measure [F1] is pressed). Use the Start/Stop key when the number of measurement data items is set to infinity.

a) If the Start/Stop key is pressed while the BER measuring instrument is operating, it stops the BER measuring instrument.
b) If the Start/Stop key is pressed when the BER measuring instrument is not operating, it starts the BER measurement from the beginning. Judge the operating status of the BER measuring instrument from the transition status of the BER data count display.

3.4 BER Measurement Interface with the Measured Equipment (1)

The BER measurement signals fetched from the measured equipment are the data signal for measurement described above and the clock signal. The measurement data entered to the MT8802A at this time is assumed to be PN9 or PN15 set on the Setup Common Parameter screen

If a signal other than Continuous is set as the output signal of the signal generator, note the followings:

1) For the measurement data, fetch the signal of the TCH part.

The output signal of the signal generator has a fixed data pattern (such as synchronous words) and the TCH data (used for the BER measurement) connected. Therefore, a signal simply modulated does not become PN9 or PN15 data correctly, and so the measurement is disabled.

2) If the signal is scrambled, unscramble it.

If the output signal of the signal generator is scrambled (Scramble On, etc.), unscramble it. The signal must be scrambled to ensure security of the data. If a scrambled signal is used as the BER measurement data to be entered to the MT8802A, it is not recognized as correct measurement data.

3) Match the data transmission clock to the BER measurement data.

If only the TCH area part is fetched as the BER measurement data, match the changing part of the data transmission clock to it. The MT8802A fetches data when the data transmission clock changes (rises or falls). If the data transmission clock changes when there is no BER measurement data, continuity of the PN data is considered to be lost. In this case, the MT8802A assumes that an error occurred.

3.5 BER Measurement Interface with the Measured Equipment (2)

Note the followings with regard to the BER measurement data and data transmission clock signals:

1) Type and length of the BER measurement signal transmission cable

A coaxial cable may be used to transmit the BER measurement data signal. Coaxial cable offers sufficient protection from external noise. However, when transmitting digital signals used for BER measurement, reflection of the signal may degrade the waveform. To solve this problem, take either of the following countermeasures:

1-1) When using coaxial cable, make the cable length short.

If a long cable is used, the waveform deteriorates (ringing, etc.) greatly at a rise or fall of the signal. If a long transmission line is required, use twisted paired cables or build an exclusive interface.

1-2) Make the lengths of the data signal transmission and data clock signal transmission cables the same.

If the time difference between the data and data transmission clock signals is large, the data location is different from the clock location, and so the correct data cannot be fetched.

2) Transmission signal level of BER measurement data signal

Input signal level to the MT8802A must be within the specified level.

The BER measurement data signal level of the MT8802A is the TTL level (+5 V C-MOS level). If the input signal level is less than this level, error or trouble may be occurred.

4.3.8 Connection test: Call processing mode

This paragraph describes the parameters setup (Setup Call Processing Parameter screen) and the connection test (Sequence Monitor screen).

(1) Setting the parameters: Setup Call Proc. Parameters screen

The following describes the parameters setup (Setup Call Processing Parameter screen) to conduct the connection test (Call processing mode).

Display the Setup Call Processing Parameter screen and set the parameters as shown below.

Step	Key operation	Description
1.	[Main Func On Off]F6	Sets Main Func to ON to display the main menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] and [∨]	Move the cursor at DUT Control.
4.	[Set]	Opens DUT Control window.
5.	Cursor [∧] and [∨]	Move the cursor at Call Proc.
6.	[Set]	Closes DUT Control window.
7.	[Call Processing]F3	Displays the Call Processing menu.
8.	Next Menu[▲]	Displays the 2nd page of the Call Processing menu.
9.	[Setup Call Proc Parameter]F9	Displays the Setup Call Processing Parameter screen.

Note: Execute the Steps 3 to 6 when the DUT Control is set to None.

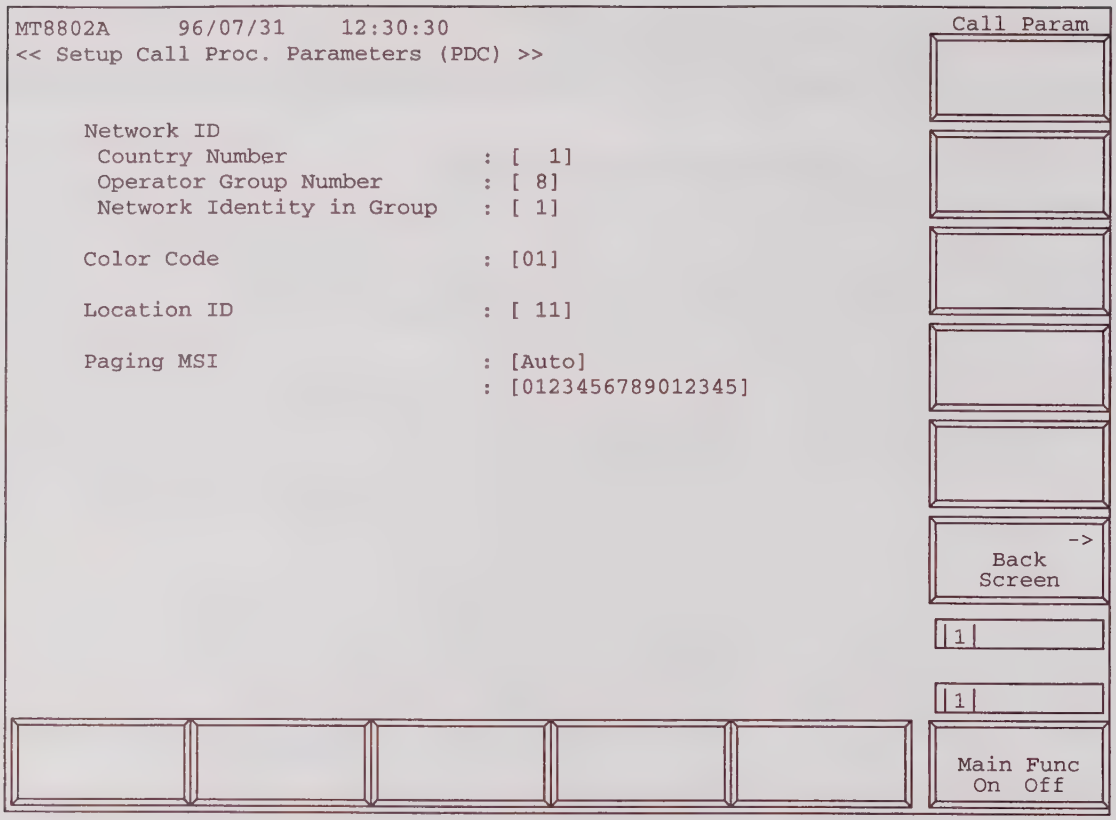


Fig. 4-21 Setup Call Processing Parameter Screen

• Set the following items:

Item	Range	Initial value
Network ID		
Country Number		
	0 to 127	1
Operator Group Number		
	0 to 15	0
Network Identity in Group		
	0 to 15	0
CCH Color Code		
	00 toFF	01
Location ID		
	0 to 225	0
Paging MSI		
	Auto, Fix	Auto
MSI		
	0 to FFFFFFFFFFFFFFFF	0123456789012345

Note: These parameter items can be set only when the Call Processing state is Stop.
Paging MSI value is used when performing Termination without Registration.
When Paging MSI is set to Auto, and the MSI is taken out from the burst signal of the radio to be tested; the taken MSI is used for Termination.

• Main function keys: None

• Function keys

[Back Screen]F12 Displays the previous screen (Setup Common Parameter screen).

(2) Connection test: Sequence Monitor screen

The following describes the call processing test conducted according to the parameters set on the Setup Call Processing Parameters and Setup Common Parameter screens.

Display the Sequence Monitor screen and conduct the connection test.

Step	Key operation	Description
1.	[Main Func On Off]F6	Sets Main Func to ON to display the main menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] and [∨]	Move the cursor at DUT Control.
4.	[Set]	Opens DUT Control window.
5.	Cursor [∧] and [∨]	Move the cursor at Call Proc.
6.	[Set]	Closes DUT Control window.
7.	[Call Processing]F3	Displays the Call Processing menu.
8.	[Sequence Monitor]F7	Displays the Sequence Monitor screen.

Note: Execute the Steps 3 to 6 when the DUT Control is set to None.

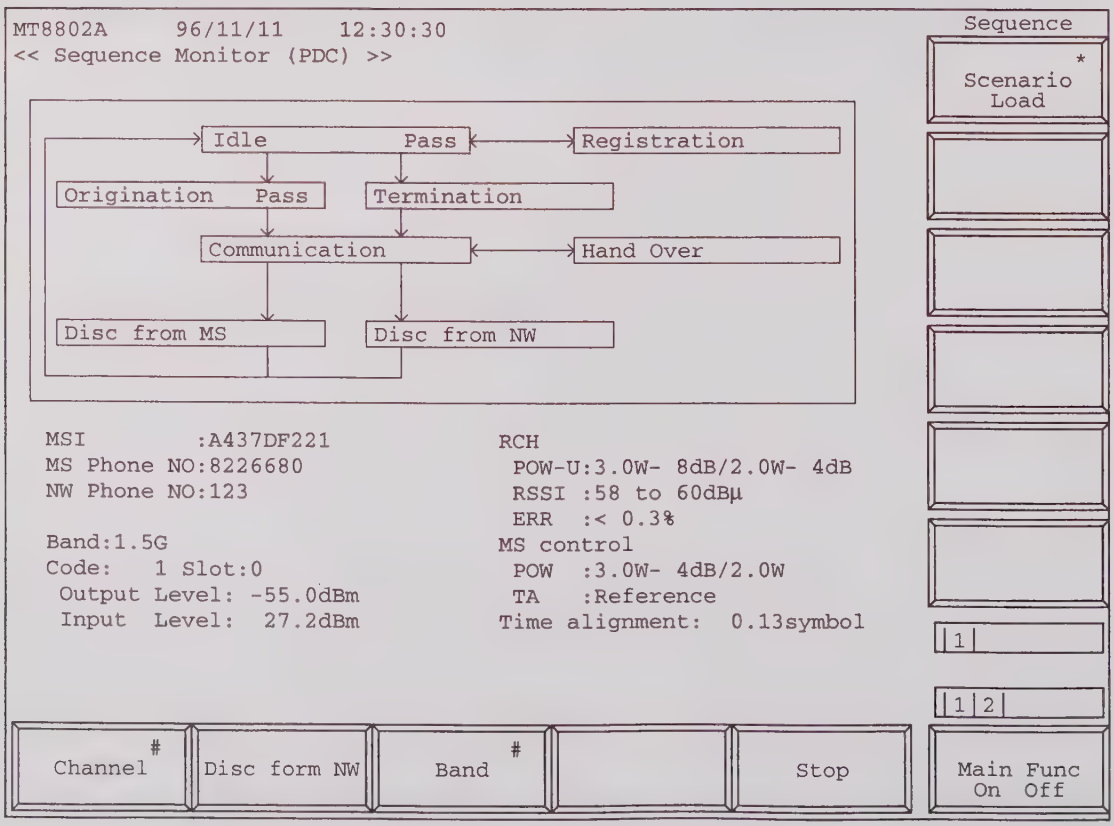
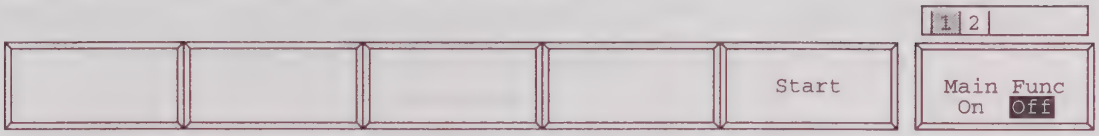


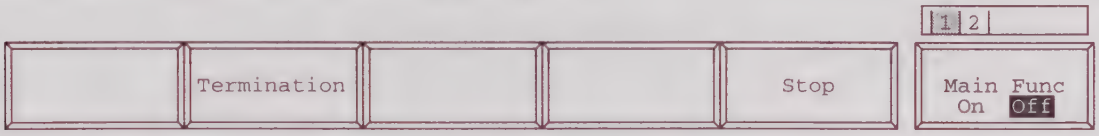
Fig. 4-22 Sequence Monitor screen

• 1st page of the main function keys on the Sequence Monitor screen

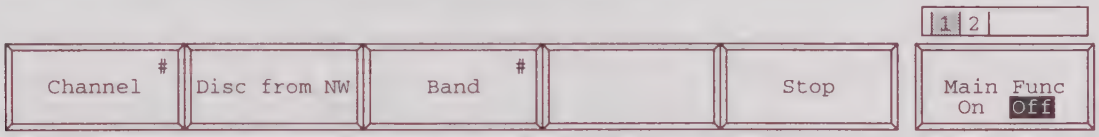
(1) When the MT8802A is at the Call Processing status of Stop.



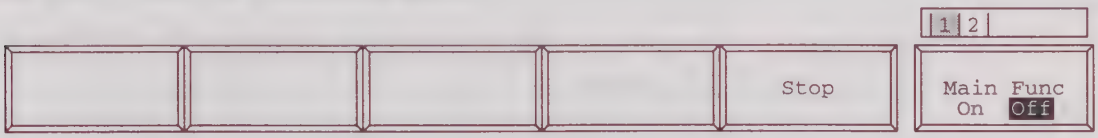
(2) When the MT8802A is at the Call Processing status of Idle.



(3) When the MT8802A is at the Call Processing status of Communiction.

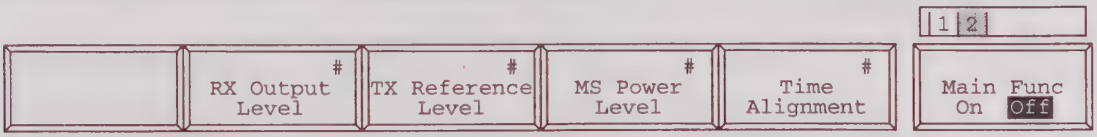


(4) When the MT8802A is at the Call Processing status of the other (Registration, Origination, Termination, Hand Over Disc from NW, and Disk from MS) than above.

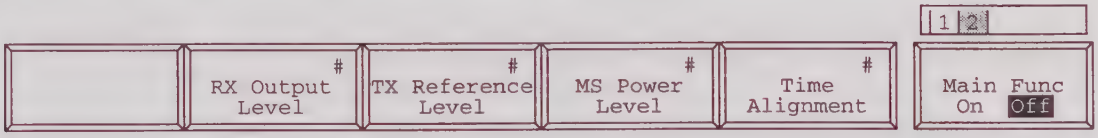


• 2nd page of the main function keys on the Sequence Monitor screen

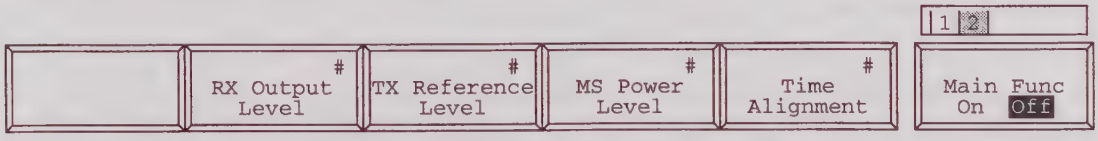
(1) When the MT8802A is at the Call Processing status of Stop.



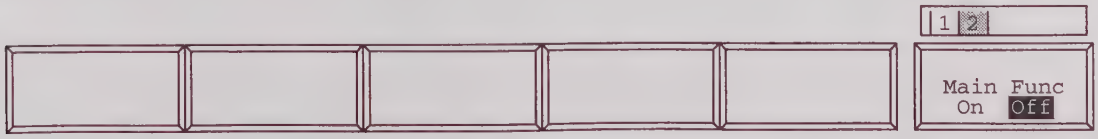
(2) When the MT8802A is at the Call Processing status of Idle.



(3) When the MT8802A is at the Call Processing status of Communication.



(4) When the MT8802A is at the Call Processing status of the other (Registration, Origination, Termination, Hand Over Disc from NW, and Disk from MS) than above.



• Displayed items are described, below: (MS: Mobile Station to be tested)

Item Description	Contents
Sequence Monitor transition diagram	Displays the current Call Processing state (black & white reserved display) and the executed results (Pass/Fail).
Setup and measured results	Displays the current set value, occupied channel, and the measured results.
MSI	Displays the received MSI.
MS Phone No	Displays the received MS phone number.
NW Phone No	Displays the received NW phone number.
(Occupied Channel)	
Band	Displays the current using Band
Code	Displays the current using channel number.
Slot	Displays the current using slot number.
(Set value)	
Output Level	Displays the MS reception level(MT8802A transmission level).
POW	Displays the specified value of the MS transmission level.
TA	Displays the specified value of the MS transmission timing.
(Reported value from MS)	
POW-U	Displays the specified value of the MS transmission level on the current channel.
RSSI	Displays the specified value(0 to 31) of the MS reception level(RSSI) on the current channel.
ERR	Displays the specified value(0 to 3) of the MS Bit-Error-Rate(BER) on the current channel.
(Measured result by MT8802A)	
Input Level	Displays the reception level of MT8802A.
Time alignment	Displays the phase difference from the received burst signal of the MT8802A.

- Main function keys

1st page

[Channel]F1	Opens the channel-number changing window to change the channel of DTCH or AVCH. *1 Appears when the MT8802A is at the Call Processing status of Communication.
[Termination]F2	Starts the Termination sequence to page the MS. Appears when the MT8802A is at the Call Processing status of Idle.
[Disc from NW]F2	Starts the Disc from NW sequence to disconnect the MS from the network. Appears when the MT8802A is at the Call Processing status of Communication.
[Band]F3	Opens the band changing window to change the band. *2 Appears when the MT8802A is at the Call Processing status of Communication.
[Start]F5	Sets the MT8802A from the Stop state to Idle state. Appears when the MT8802A is at the Call Processing status of Stop.
[Stop]F5	Sets the MT8802A to Stop state. Appears when the MT8802A is at the Call Processing status of the other (Idle, Registration, Origination, Termination, Communication, Hand Over, Disc from NW, and Disc from MS) than Stop.

*1 Executes the Hand Over sequence to change channel.
*2 Executes the Hand Over sequence to change channel.
At the destination band, the channel number is set the minimum value, automatically.

2nd page .... Appears when the MT8802A is at the Call Processing status of Stop, Idle, or Communication.

[RX Output Level]F2	Changes the reception level of the MS (i.e. the output level of the MT8802A).
[TX Reference Level]F3	Changes the reference level of the MT8802A to measure the transmission level of the MS (i.e. the reception level of the MT8802A).
[MS Power Level]F4	Changes the transmission level of the MS.
[Time Alignment]F5	Changes the burst transmission timing of the MS.

- Function keys

[Scenario Load] F7	This key is selected when a new scenario file is to be loaded from FD. Loading a new scenario file enables the Call Processing operations to be changed from the factory default.
[File No.]F9	This key opens a child window and shows the list of the numbers of scenario files. By selecting the number of a dedsired file, a new scenario file is loaded form FD. Starting up the system automatically loads the factory default scenario files from the internal memory. To use other scenario files, you have to use this function, to re-load the desired scenario file after the system power-up. 0-99, Resolution: 1, Initial value: 0
[Default] F10	This key returns the system to standard Call Processing operations by re-loading the factory default scenario file.
[Return] F12	Returns to previous menu.
[Back Screen] F12	Displays the previous screen.

4.3.9 Saving and recalling parameter data:

Save Parameter screen, Recall Parameter screen

Display the Save Parameter and Recall Parameter screens according to the following steps to save or recall parameters set for the transmitter and receiver test.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on. The first page of the Main Menu appears at the bottom of the screen.
2.	[Recall]F4	Sets Recall Parameter mode. The Recall Parameter screen appears. The Recall function key menu appears on F7 to F12.
2'	[Save]F5	Sets Save Parameter mode. The Save Parameter screen appears. The Save function key menu appears on F7 to F12.

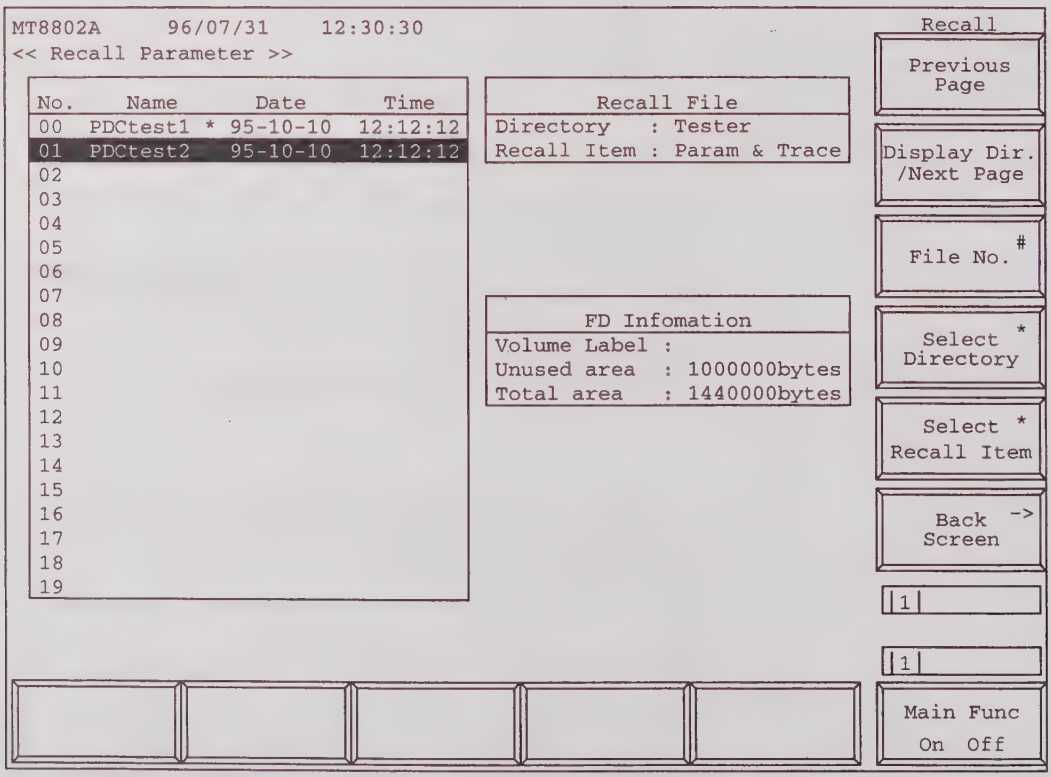


Fig. 4-23 Recall Parameter Screen

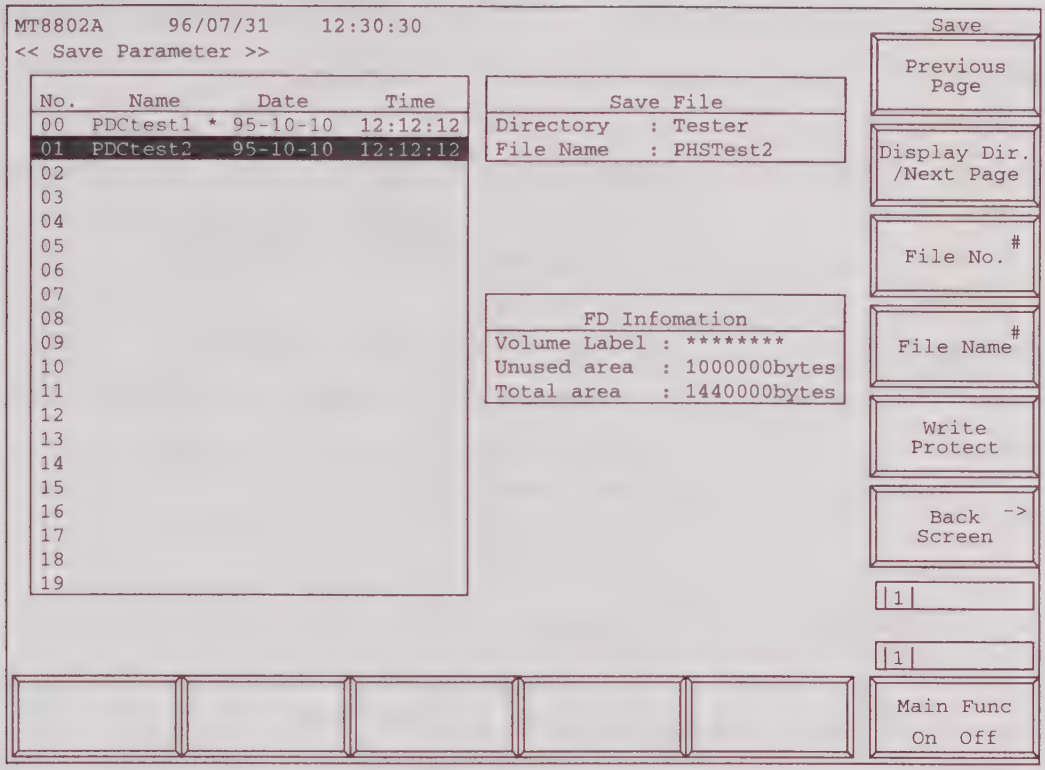


Fig. 4.24 Save Parameter Screen

- Floppy disk to be used:

  For saving and loading parameters and data, use the floppy disk described in Section 3. When the floppy disk is required to be formatted, use the File Operation screen in Paragraph 4.3.4.

- Notes when displaying the Save Parameter screen and Recall Parameter screen:

  Before pressing the [Save]F5 or [Recall]F4 function key, insert a floppy disk(FD) in the FD driver of the MT8802A. Then press the key. The MT8802A automatically starts the FD-driver operation.

- Screen display and function key display:

  Pressing the [Save]F5 or [Recall]F4 function key changes only the display of the F7 to F12 function keys.

  The screens (Figs. 4-22, 4-23) appear when the [Display Dir./Next Page] F8 key is pressed to display the contents of the FD. These screens also display the function keys used to select any directory and any file.

- Information to be saved and recalled:

  1) The [Save] and [Recall] keys on the main function keys saves and recalls the measurement parameters except those in paragraphs 2) and 3) below, respectively.

  2) The Save Template and Recall Template screens under the RF Power screen saves and recalls only the template level information, respectively.

  3) The Save Pattern and Recall Pattern screens under the Setup RX Measure screen saves and recalls only the pattern information of the measurement test signals, respectively.

- Function keys on the Recall Parameter screen

Main function key: None

Recall function keys:

[Display Dir.]F8: Accesses the floppy disk and displays the directory of the parameter data file. The lower-order Recall menu appears. (This menu consists of two pages. Use the Next Menu [▲] key to scroll to the next page.)

** 1st page**

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[File No.]F9: Opens the window for entering the recall position (number) of the setup parameter data file.
0 to 99, Resolution: 1, Initial value: 0

** 2nd page **

[Select Display Mode]F7: Displays the Display Mode menu to select a display mode.

[Wide]F7: Displays file numbers in ascending order from 0 regardless of whether all files are saved.

[Narrow]F8: Skips the numbers of files not saved and displays only the numbers of saved files in ascending order.

[return]F12: Returns to the previous menu.

[File No.]F9: Opens the window for entering the recall position (number) of the setup parameter file.
0 to 99, Resolution: 1, Initial value: 0

[return]F12: Returns to the previous menu.

- Function keys on the Save Parameter screen

Main function key: None

Save function keys:

[Display Dir.]F8: Accesses the floppy disk and displays the directory of the parameter data file. The low-order Save menu appears.

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[File No.]F9: Opens the window for entering the save position (number) of the setup parameter data file.
0 to 99, Resolution: 1, Initial value: 0

[File Name]F10: Opens the window for entering the name of the parameter data file to be saved.
The data file name consists of up to eight characters.

[Write Protect]F11: Write-protects the specified parameter data file.
An asterisk (*) is displayed at the end of the name of the write-protected file.
If the specified parameter data file is already write-protected, this key cancels write protect.

Note: This function can only be executed through panel operation.

[return]F12: Returns to the previous menu.

• Saving parameters and data

This paragraph describes how to save the measurement parameters of the MT8802A to a floppy disk.

Step	Key operation	Description
A When the [Save]F5 main function key is used		
1.		Insert a saving floppy disk(FD) into the FD driver on the bottom left of the MT8802A.
2.	[Main Func on off]F6	Sets Main Func to on. The Main Menu is displayed on the main function keys.
3.	[Save] F5	Changes to Save parameter mode. Displays the Save function keys in F7 to F12, and then moves to the Save screen for parameter and data. Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
B When the [Save Template]F7 function key of the RF Power screen is used		
1.		Insert a saving floppy disk(FD) into the FD driver on the bottom left of the MT8802A.
2.	[Save Template]F7	Displays the Save Template screen. Displays the Save function keys in F7 to F12, then moves to the Save screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
C When [Save Pattern]F7 function key of the Setup RX Measure screen is used		
1.		Insert a saving floppy disk(FD) into the FD driver on the bottom left of the MT8802A.
2.	[Save Pattern]F7	Changes to the Save Pattern screen. Displays the Save function keys in F7 to F12, then moves to the Save screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
(Under state where the Save menu is displayed)		
5.	[Display Dir./Next Page]F8	Displays existing files to check the number of the file to be saved.
6.	[File Name]F10	Sets the file name used for save within 8 alphanumeric characters if necessary.
7.		Check the number of the file to be saved and the file status (whether the file exists and whether the file is write-enabled). To write-enable the file, proceed to Steps 8a and later. Otherwise, proceed to Step 9.
8a.	Cursor [∧] and [∨]	Select the file to be write-enabled.
8b.	[Write Protect] F11	Write-enables the file for over-writing.
9.	[File No.] F9	Specify the number of the file to be saved.
10.	[Set]	Saves the file.
11.	[Back Screen]F12	Returns to the previous screen.

• Write-protecting or write-enabling the file to be saved

This paragraph describes how to write-protect or write-enable the file containing data in the Save screen.

Step	Key operation	Description
1.		Execute the Steps 1 to 4 of the saving procedure in the previous paragraph to display the Save menu.
2.	[Display Dir./Next Page]F8	Displays the existing files. Check the number of the file to be saved.
3.	Cursor [∧], [∨]	Select the file to be write-enabled.
4.	[Write Protect]F11	Write-protects or write-enables the file to be saved.
5.	[Back Screen]F12	Returns to the previous screen.

• Recalling parameters and data

This paragraph describes how to recall measurement parameters from the floppy disk.

Step	Key operation	Description
A When the [Recall]F5 main function key is used:		
1.		Insert a recall floppy disk(FD) into the FD driver at the bottom left of the MT8802A.
2.	[Main Func on off]F6	Sets Main Func to on. Displays Main Menu on the main function keys.
3.	[Recall]F5	Changes to Recall Parameter mode. Displays the Recall function keys in F7 to F12, and moves to the Recall screen for parameter and data. Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
B When [Recall Template]F7 function key of RF Power screen is used		
1.		Insert a recall FD into the FD driver at the bottom left of the MT8802A.
2.	[Recall Template] F7	Changes to the Recall Template screen. Displays the Recall function keys in F7 to F12, then moves to the Recall screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
C When the [Recall Pattern]F7 function key of Setup RX Measure screen is used		
1.		Insert a recall floppy disk(FD) into the FD driver at the bottom left of the MT8802A.
2.	[Recall Pattern]F7	Changes to the Recall Pattern screen. Displays the recall function keys in F7 to F12, then moves to the Recall screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
(Under state where the Recall menu is displayed)		
5.	[Display Dir./Next Page]F8	Displays the directory containing the file to be recalled. Check the file to be recalled.
6.	Cursor[∧][∨]	Select the file to be recalled.
7.	[File No.]F9	Sets the number of any file to be recalled. (The file to be recalled can be specified by the file number, too.)
8.	[Set]	Confirms the file to be recalled. The MT8802A reads the specified file. Then, returns to the previous screen automatically.

• Changing the recall-file display format(WIDE/NARROW)

This paragraph describes how to change the recall-file display format(WIDE/NARROW).

Step	Key operation	Description
1.		Execute the Steps 1 to 5 of the recalling procedure in the previous paragraph to display the recalled file.
2.	Next Menu [▲]	Displays the second page of the function keys.
3.	[Select Display Mode]F7	Displays the file display format selection menu.
4.	[Wide]F7 or [Narrow]F8	Specify the display format.
5.	[return]F12	Returns to the previous menu.

4.3.10 Operating the file: File Operation screen

To access the floppy disk and display the parameter file directory, delete or write-protect the parameter file, and initialize the floppy disk; display the File Operation screen according to the following steps.

Note: This function can only be executed through panel operation.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on. The Main Menu appears at the bottom of the screen
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[File Operation]F4	Sets File Operation mode. The File Operation screen appears. The File function key menu appears on F7 to F12.

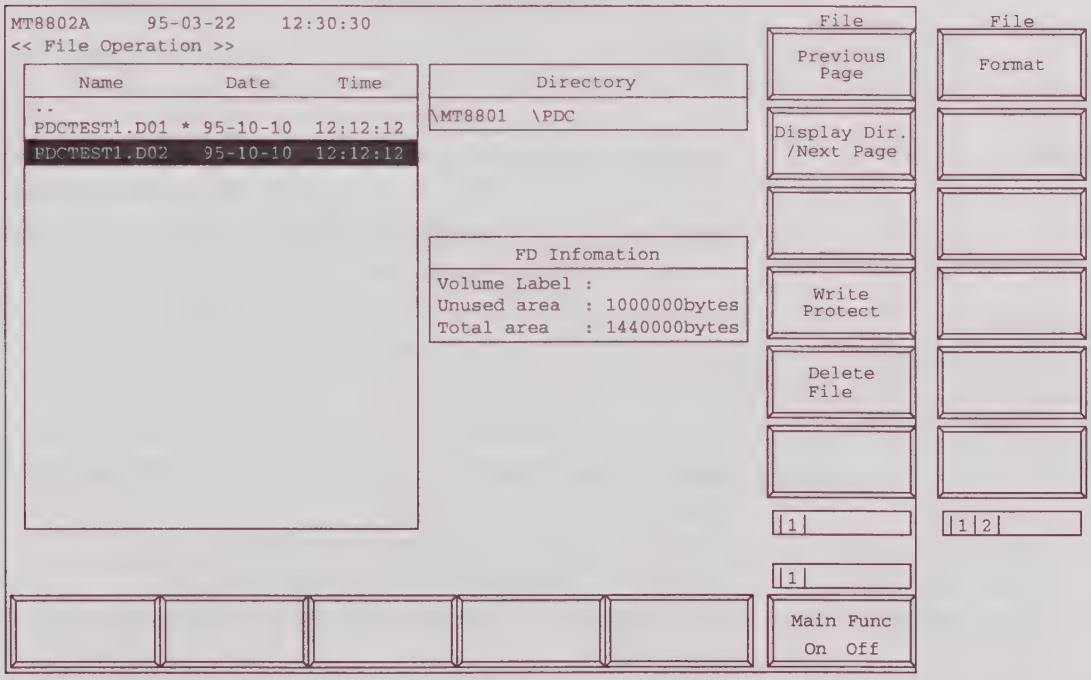


Fig. 4-25 File Operation Screen

Note: Use the floppy disk described in Section 3.

• Functions keys on the File\ Operation screen

Main function key: None

Function keys: 2 pages. Use the Next Menu [◢◣] key to scroll to the next page.

** 1st page **

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[Write Protect]F10: Write-protects the specified parameter data file.
An asterisk (*) is displayed at the end of the name of the write-protected file.
If the specified parameter data file is already protected, write protect can be canceled by pressing this key.

Note: This function can only be executed through panel operation.

[Delete File]F11: Opens the window for entering the position (number) of the parameter data file to be deleted.
Setup range: 0 to 99 (integer)
Initial value: 0

** 2nd page **

[Format]F7: Initializes the floppy disk to the specified type. The initialization format is MS-DOS 1.44 MB or 720 kB.

Note: The format is MS-DOS 1.44 MB or 720 kB. Use the 2HD or 2DD type of 3.5-inch floppy disk.

• Displaying files

This paragraph describes how to display the files in FD.

Step	Key operation	Description
1.		Insert a floppy disk(FD) into the FD driver at the bottom left of the MT8802A.
2.	[Main Func on off]F6	Turn the Main Func on to display the main function keys.
3.	Next Menu [◀]	Displays the second page of the main function keys.
4.	[File Operation]F4	Moves to the File Operation screen. Accesses the FD to display the root directory.
5.	Cursor [∧][∨]	Specify the directory to be required.
6.	[Set] or [Enter]	Moves to the specified directory to display its contents.
7.		Repeat the Steps 5 and 6 above to display the required directory.

Note: The sub-directories and file name under the selected directory are displayed in the frame on the left of the screen.
For directories, only their names are displayed in the "Name" field.
For files, Name/Date/Time are displayed.
The Directory field at the upper right of the screen displays the layer and location of the selected directory.

• Write-enabling/write-protecting files

This paragraph describes how to change the file write mode between the write-protected and write-enabled modes.

Step	Key operation	Description
1.		Select the directory of the desired file by the displaying-file procedure above.
2.	Cursor [∧][∨]	Specify the file.
3.	[Write Protect]F10	Changes the file write mode.

• Deleting files

This paragraph describes how to delete the parameter/data files.

Step	Key operation	Description
1.		Select the directory of the desired file by the displaying-file procedure above.
2.	Cursor [∧][∨]	Specify the file.
3.	[Delete File]F11	Opens the confirmation window.
4.	Cursor [∧][∨]	Select Yes or No. "Yes" deletes the specified file.

Note: Once a file is deleted, it cannot be restored.

• Initializing(formatting) floppy disk

This paragraph describes how to initialize a floppy disk.

Step	Key operation	Description
1.		Insert a floppy disk(FD) into the FD driver at the lower left of the MT8802A. The acceptable FD is the 2HD(1.44 M-bytes) or 2DD(720 k-bytes) type.
2.	Next Menu [▲]	Displays the second page of the function keys.
3.	[Format]F7	Initializes the floppy disk. During initialization, a window indicating initialization appears on the screen.
4.	Next Menu [▲]	Returns to the first page of the function keys.

Note: Once a floppy disk is initialized, the data recorded on the disk is all lost.

4.3.11 Screen hard copy: Copy

The copy function transfers a screen display to the printer or floppy disk. Specify a transfer destination and mode on the Instrument Setup screen. Press the Copy key on the front panel to activate the Copy function. While the Copy function is operating, operations (including remote control) such as measurement or internal setting are disabled.

(1) Transfer to the printer

If Copy is set to the printer on the Instrument Setup screen, screen display can be printed via the Parallel interface on the rear panel. Printers using the ESC/P command system can be used.

(2) Transfer to the floppy disk

If Copy is set to BMP on the Instrument Setup screen, the floppy disk driver on the front panel can be used to store data displayed on the screen in the floppy disk. Paragraph 4.3.10 describes the floppy disks that can be used. Data created on the floppy disk is the image file of the monochrome BMP data format. While the Copy is being executed, the name of the created file "RCA_***.BMP" is displayed on the bottom of the screen (*** is a number beginning with 000).

(Reference) Number of storable BMP files

2DD (720K bytes): Up to 18

2HD (1.44M bytes): Up to 37

4.3.12 Settings relating to remote control and panel key control

1. Remote control interfaces

The remote control interfaces of the MT8802A are classified into the GPIB interface and serial interface (RS-232C interface). Select an interface used on the Instrument Setup screen (see paragraph 4.3.3).

2. Remote control and panel control keys

The keys and lamps described in this section are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the MT8802A is controlled remotely using the GPIB interface or RS-232C interface. When the MT8802A is controlled remotely from an external controller via the GPIB interface or RS-232C interface, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. The LOCAL key is used to cancel the remote control status of the GPIB interface or RS-232C interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary encoder entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary encoder entry from the front panel. Use the PANEL LOCK key to prevent an incorrect operation on the front panel for automatic measurement or status holding. When the panel is locked, the red lamp on the PANEL LOCK key lights.

3. Remote control status

If the MT8802A is controlled remotely, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. To change from the remote control status to the front panel entry status, execute the following steps:

1) Halt the remote control.

2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.

SECTION 5
PERFORMANCE TESTS

This section lists the equipment used in performing the MT8802A performance tests, and explains the setup and the performance test items.

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5.1 Requirement for Performance Tests

The performance tests are carried out as a part of preventive maintenance to prevent deterioration of the MT8802A.

Use the performance test procedures at acceptance inspection, periodic inspection, and after repair of the MT8802A. Do the important parts of preventive maintenance periodically. This section explains the following test procedures:

- Reference oscillator frequency stability
- Frequency/modulation measurement accuracy
- Transmission power measurement accuracy
- Signal-generator frequency accuracy
- Signal-generator output level accuracy
- Signal-generator modulation accuracy

For important evaluation items, execute the performance tests at regular intervals for preventive maintenance. We recommend that the performance be inspected regularly once or twice a year.

If the specifications are not met in the performance tests, please contact the Service Department of Anritsu Corporation.

5.2 Instruments Required for Performance Test

The instruments required for performance tests are shown below.

Instruments Required for Performance Test

Recommended instrument name (model name)	Required performance†	Test item
Synthesized signal generator (MG3633A)	• Frequency range: 100 MHz to 1 GHz 1 Hz resolution • Output level range: -20 to +10 dBm Resolution of 0.1 dB possible • SSB phase noise ≤-130 dBc/Hz (at 10 kHz offset) • Second harmonic ≤-130 dBc • External reference input (10 MHz)	Frequency/modulation accuracy Transmission power measurement accuracy
Power Meter (ML4803A)	• Main-frame accuracy: ±0.02 dB • Frequency range: 100 kHz to 8.5 GHz (depending on the power sensor type)	Frequency/modulation accuracy Output level accuracy
Power Sensor (MA4601A)	• Frequency range: 10 MHz to 3 GHz • Measurement power range: -30 to +20 dBm • Input connector: N type	Frequency/modulation accuracy
Power Sensor (MA4602A)	• Frequency range: 10 MHz to 3 GHz • Measurement power range: -70 to -20 dBm • Input connector: N type	Frequency/modulation accuracy Output level accuracy
50Ω terminator (MP752A)	• Frequency range: DC to 8.5 GHz • VSWR ≤ 1.2	Frequency/modulation accuracy
Fixed attenuator (MP721B)	• Att: 6 dB • VSWR: < 1.2	Transmission power measurement accuracy
Frequency counter (MF1603A)	• 100 kHz to 3 GHz • Number of display digits: 10 • Resolution: 1 Hz • External reference input: (10 MHz) possible	Reference oscillator frequency accuracy Carrier frequency
Digital mobile radio transmitter tester (MS8604A)	• Vector error: 1.8% rms or less	Modulation accuracy
Frequency standard	• Frequency: 10 MHz • Stability: ≤ 1×10^{-9}	Reference-oscillator frequency stability
4-port junction pad (MA1612A)	• Frequency range: 10 MHz to 2 GHz	Frequency/modulation accuracy

†Extracts part of performance which can cover the measurement range of the test item.

5.3 Performance Tests

Do not start the performance tests until the equipment to be tested and the measuring instruments have warmed up for at least 30 minutes and the MT8802A completely stabilized. Conduct the test at room temperature. Keep AC supply voltage fluctuations, noise, vibration, dust, humidity and any other factor which can affect results to a minimum.

5.3.1 Reference oscillator frequency stability

This test tests the frequency stability of the 10 MHz crystal oscillator used as the reference oscillator. Measure the frequency changes after 24-hour operation at 25°C (aging rate) and at 0 and 50°C (temperature characteristics).

(1) Specifications

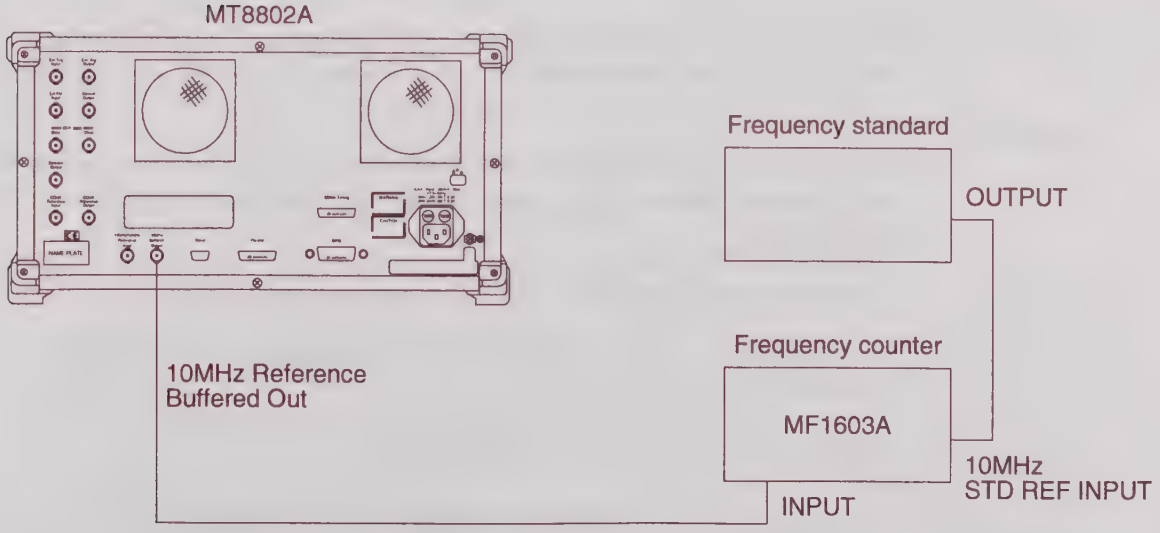
Reference oscillator

- Frequency: 10 MHz
- Aging rate: $\leq 2 \times 10^{-8}$/day (After 24-hour operation, 25°C ± 5°C)
- Temperature stability: $\pm 5 \times 10^{-8}$ (0°C to 50°C, reference at 25°C)

(2) Test instruments

- Frequency counter: MF1603A
- Frequency standard: with stability of $\leq \pm 1 \times 10^{-9}$

(3) Setup



Reference Oscillator Frequency Stability Test

(4) Procedure

Agin rate: Test this at an ambient temperature change less than ±2°C in a vibration-free place.

Step	Procedure
1.	Set the reference signal changeover switch (FREQ STD:INT/EXT) on the MF1603A rear panel to EXT.
2.	Set the power supply switch on the MT8802A rear panel to On. Then, set the Power switch on the MT8802A front panel to On.
3.	Measure the frequency of the output from the 10 MHz Reference Buffered Out connector using the MF1603A after 24-hour operation with 0.1 Hz digit resolution.
4.	Measure the frequency of the same output using the MF1603A after 24 hours from the measurement in step 3.
5.	Calculate the stability using the following equation $\text{Frequency stability} = \frac{\text{(MF1603A reading in step 4) - (MF1603A reading in step 3)}}{\text{(MF1603A reading in step 3)}}$

Temperature stability: Test this in a vibration-free constant-temperature chamber.

Step	Procedure
1.	Set up the MT8802A in a constant-temperature chamber at 25°C.
2.	Set the Power switches on the MT8802A rear and front panels to On, and wait until the MT8802A internal temperature stabilizes, and wait approx. 1.5 hours after the chamber temperature stabilizes.
3.	When the internal temperature stabilizes, measure the frequency of the output from the 10 MHz Reference Buffered Out connector of the MT8802A using the MF1603A with 0.1 Hz digit resolution.
4.	Change the chamber temperature to 50°C.
5.	When the chamber temperature and the MT8802A internal temperature re-stabilize, measure the frequency using the MF1603A.
6.	Calculate the stability using the following equation: $\text{Frequency stability} = \frac{\text{(MF1603A reading at 50°C) - (MF1603A reading at 25°C)}}{\text{(MF1603A reading at 25°C)}}$
7.	Change the chamber temperature to 0°C and repeat steps 5 and 6

5.3.2 Frequency/modulation mesurement accuracy

Input an unmodulated signal from signal generator 1 with a shifted frequency, and use it as a signal pseudo-modulated with data "00". Generate and use a signal of the required modulation accuracy by super-imposing the signal with the undesired wave from signal generator 2.

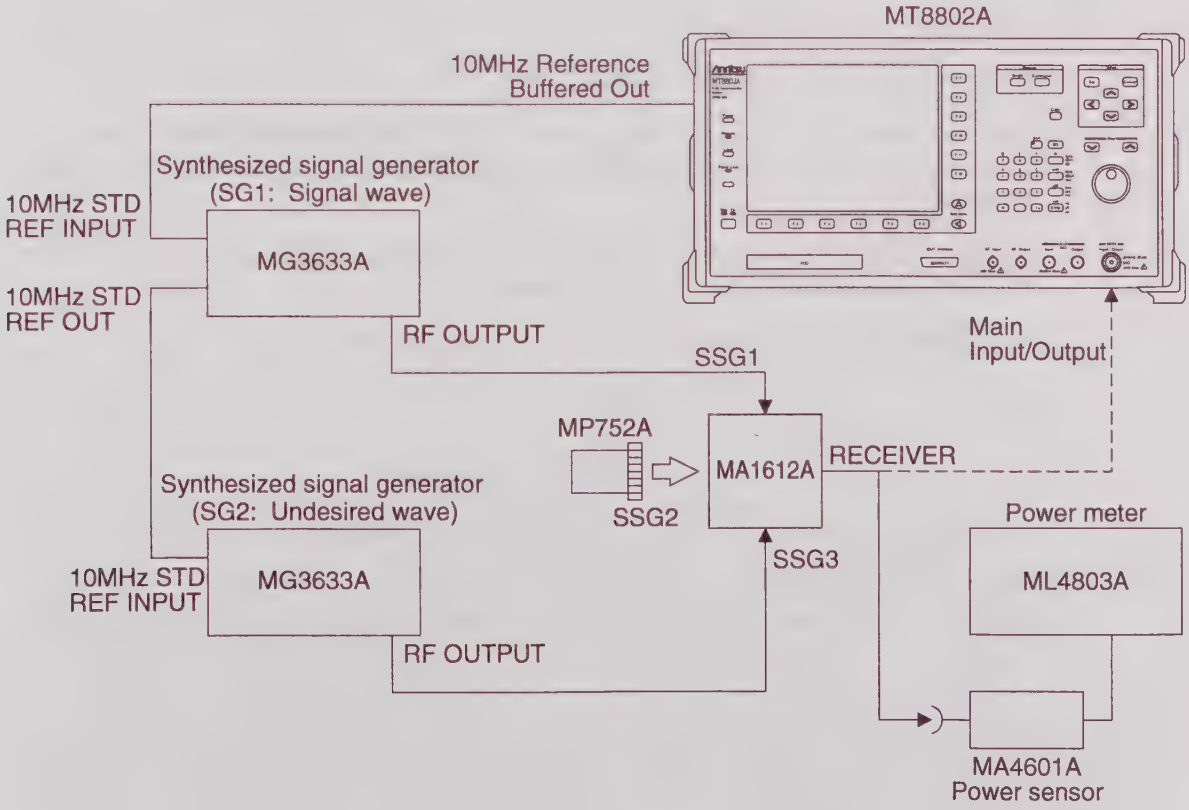
(1) Specifications

- Carrier frequency accuracy: ± (Reference crystal oscillator accuracy + 1 Hz)
- Modulation accuracy: ± (2% + 0.5% of the indicated value)

(2) Test instruments

- Synthesized signal generator: MG3633A
- Power meter: ML4803A
- Power sensor: MA4601A
- 4-port junction pad: MA1612A
- 50Ω terminator: MP752A

(3) Setup



(4) Test procedure: frequency/modulation accuracy

Step	Procedure

1. Set the MG3633A Signal Generator as shown below:

   SG1 (signal wave): FREQUENCY: ..... Frequency shown in the table + 2.625 kHz
   Unmodulated
   SG2 (undesired wave): FREQUENCY: ..... Frequency shown in the table + 1.3125 kHz
   Unmodulated

2. Set the SG1 output to ON, SG2 output to OFF, and adjust the output level of SG1 so that power meter ML4803A reads 0 dBm. Then, press the dB (REL) key of the ML4803A.

3. Set the SG1 output to OFF, SG2 output to ON, and adjust the output level of SG2 so that power meter ML4803A reads -18.06 dB ± 0.05 dB. *3

4. Set the MT8802A as shown below:

   RF Input/Output: Main: Specify this item on the Instrument Setup screen.

   Tx Measure Ref level: 0 dBm: Set this item on the Setup Common Parameter screen.

   Signal: CONTINUOUS: Set this item on the Setup Common Parameter screen.

   Tx Measure Frequency: Frequency shown in the table: Set this item on the Setup common Parameter screen.

5. Set the SG1 output to ON and the SG2 output to OFF.

6. Press the [Modulation Analysis] (F7) key of the MT8802A to read the indicated carrier frequency error and RMS vector error. The read RMS vector error represents the residual vector error of the MS8604A.

7. Set the SG1 output to ON and the SG2 output to ON. Then, check the RMS vector error is within the maximum and minimum values shown in the following table.

8. Repeat steps 1 to 7 for the other frequencies shown in the following table.

Frequency/modulation accuracy test

Frequency (MHz)	Carrier frequency error			RMS vector error					
	Frequency measurement accuracy (kHz)			Residual vector error (%)			Modulation accuracy (%)		
	Minimum	Actual	Maximum	Minimum	Actual	Maximum	Minimum	Actual	Maximum
10	–0.010	_____	+ 0.010	0.00	_____	0.70	11.55	_____	13.45
1000	–0.010	_____	+ 0.010	0.00	_____	0.70	11.55	_____	13.45
2000	–0.010	_____	+ 0.010	0.00	_____	0.70	11.55	_____	13.45

*1 The frequency deviation when the phase change is +45°/symbol is calculated as Symbol rate/8 = 2.625 KHz

*2 1.3125 kHz = Symbol rate/16 = 21 kHz/16

*3 10 Exp (–18.06/20) = 0.125 = 12.5 % modulation accuracy

5.3.3 Transmission power measurement accuracy

This test tests the power measurement function using the unmodulated, continuous wave supplied from the signal generator.

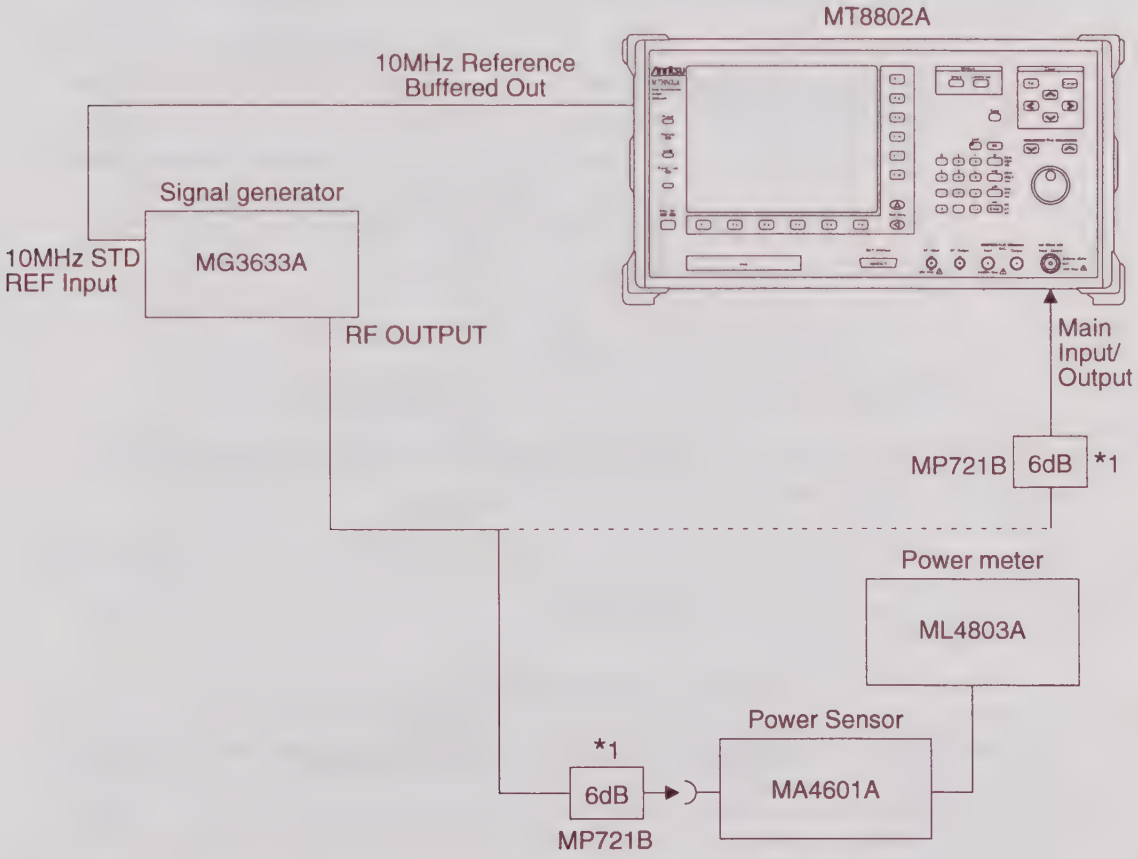
(1) Specification

- Transmission power accuracy: ±10%

(2) Test instrument

- Signal generator: MG3633A

(3) Setup



*1 The MP721B is used to improve the impedance matching of the MG3633A

(4) Test procedure: transmission power measurement accuracy

Step	Procedure
1.	Set the MG3633A Signal Generator as shown below: FREQUENCY ..... 1,000 MHz OUTPUT LEVEL ..... +16 dBm
2.	Connect the MG3633A output to the MA4601A Power Sensor, and measure the output level of the MG3633A with the ML4803A Power Meter.
3.	Set the MT8802A as shown below: RF Input/Output: Main — Set in the Instrument Setup screen. TX Measure REF Level:+10 dBm — Set in the Setup Common Parameter screen. TX Measure Frequency: 1000 MHz — Set in the Setup Common Parameter screen. Measuring Object: Continuous — Set in the Setup Common Parameter screen.
4.	Press the [Power Meter]F12 key of the MT8802A to display the Power Meter screen.
5.	Press the [Zero Set]F11 key to calibrate the zero point.
6.	Connect the MG3633A output to the MT8802A Main connector.
7.	Press the [Adjust Range]F10 key, then read the measured value.
8.	Display the Setup Common Parameter screen on the MT8802A, and press the [RF Power]F9 key to change to the RF Power screen.
9.	Press the [Manual Calibration]F7 key to calibrate the MT8802A on the RF Power screen.
10.	Read the measured results(TX power).

Transmission Power Measurement Accuracy Test

Actual power meter reading (dBm)	MT8802A TX power measured value (dBm) on Power Meter screen	MT8802A TX power measured value (dBm) on RF Power screen	Measurement uncertainty (dB)
			±0.15

5.3.4 Signal-generator frequency accuracy

Check the carrier frequency accuracy.

(1) Specification

- Accuracy: Accuracy of reference frequency ±100 MHz

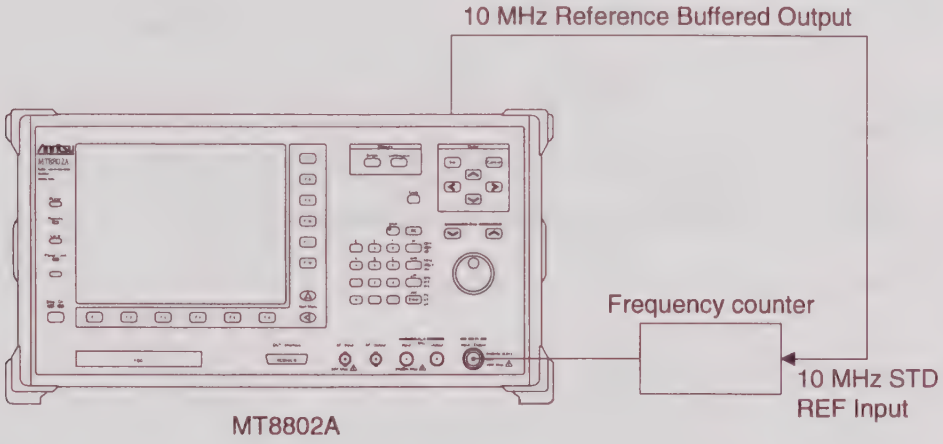
(2) Test instrument

- Frequency counter: MF1603A

(3) Notes on test

The value indicated on the counter may contain an error of ±1 count.

(4) Setup



(5) Procedure

Step	Procedure
1.	Set the MT8802A to RX Measure mode.
2.	Press the [BER Measure] (F6) key of the MT8802A.
3.	Set the MT8802A to a measurement frequency, and set the output level to –28 dBm, and the modulation to Off.
4.	Confirm that the frequency counter reading indicates 10 MHz ±100 MHz.

5.3.5 Signal-generator output level accuracy

(1) Specifications

Connector	Output level	10 MHz to 1 GHz	>1 GHz
Main Input/Output	–123 to –13 dBm –133 to –123.1 dBm	±1 dB ±3 dB	±2 dB ±4 dB
AUX Output	–123 to +7 dBm –133 to –123 dBm	±1 dB ±3 dB	±2 dB ±4 dB

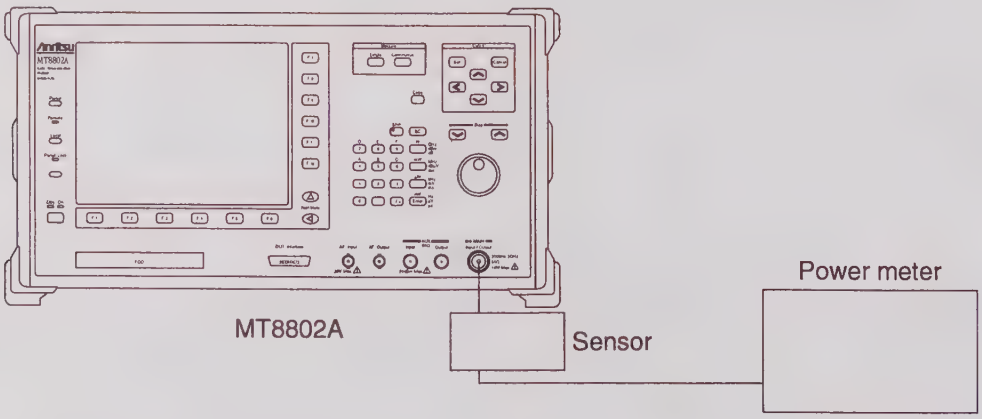
(2) Test instruments

- Power meter: ML4803A
- Power sensors: MA4601A (-30 to +20 dBm, for AUX Output)
  MA4602A: (-70 to -20 dBm, for Main)

(3) Notes on test

Connect the MA4602A Power Sensor directly to the Main Input/Output connector.
Connect the MA4601A Power Sensor to the AUX Output connector via accessory coaxial adapter N-J.TNC-P.

(4) Setup



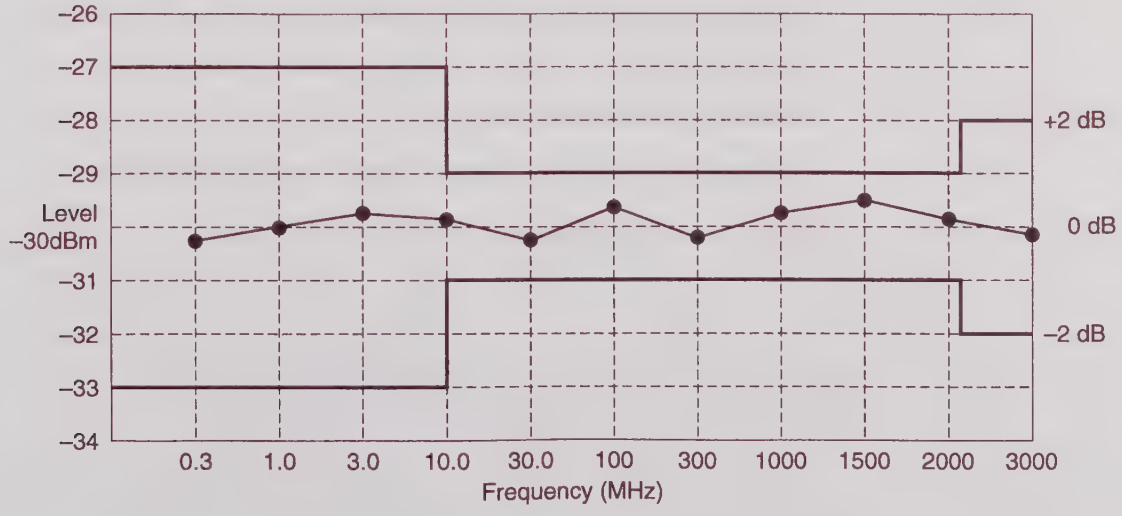
(5) Procedure

Step	Procedure

1. Set the MT8802A to RX Measure mode.
2. Press the [BER Measure]F6 key of the MT8802A.
3. Set the [RF Off] key of the MT8802A to OFF.
4. Adjust the zero point of power meter ML4803A and calibrate the sensor sensitivity.

Frequency (MHz)	0.3	1.0	3.0	10.0	30.0	100	300	1000	1500	2000	3000
Measured output level (dBm)											
Difference from -30 dBm (dB)											
Measurement uncertainty (dB)	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18

5. Set the output level of the MT8802A to a measurement value (e.g. -30 dBm).
6. Press the F5 key of the MT8802A to set the modulation to OFF.
7. Set the MT8802A to the required frequency (e.g.one of the frequency shown in the above table).
8. Set the sensor calibration coefficient of the power meter, and measure the output level of the MT8802A.
9. Record the difference between the read value and -30 dBm.
10. Repeat steps 7 to 9, and check that the difference between the output level and the set value is within the specified range.



5.3.6 Signal-generator modulation accuracy

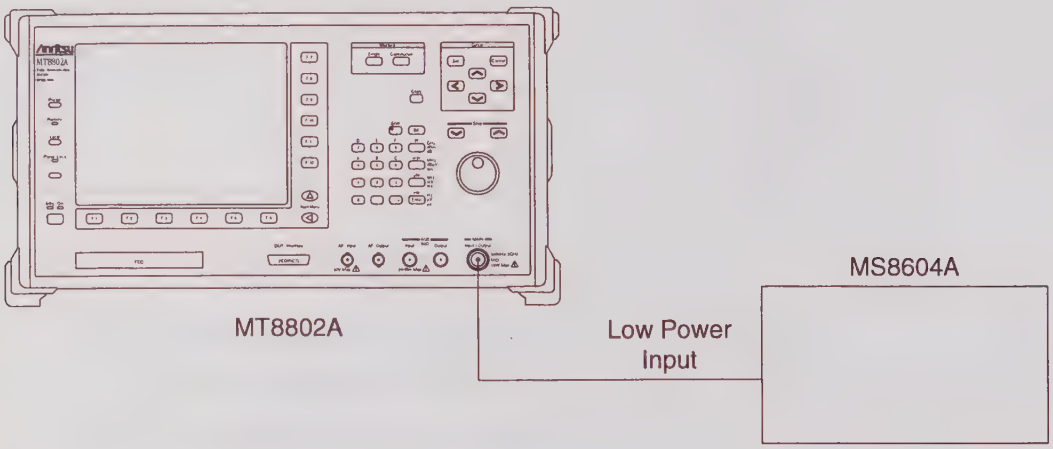
(1) Specification

- Modulation accuracy: Vector error: ≤ 3% rms

(2) Test instrument

- Digital mobile radio transmitter tester: MS8604A

(3) Setup



(4) Procedure

Step	Procedure
1.	Set the MT8802A to RX Measure mode, and set parameters of the signal etc.
2.	Set the MT8802A to the Setup RX parameter mode, set parameters, and press the F12 key.
3.	Set the MT8802A to BER Measure mode.
4.	Set the output level of the MT8802A to -30 dBm, and set the carrier frequency to the measurement frequency.
5.	Set the modulation of the MT8802A to ON.
6.	Connect the RF output of the MT8802A to the RF input of the MS8604A.
7.	Operate the MS8604A to measure the modulation accuracy.

Notes: • For how to operate the MS8604A, refer to the MS8604A Operation Manual.
• Option 11 (for PDC) is required for the MS8604A.

5.3.7 Example of performance test result entry sheet

This paragraph gives an example of sheets used to summarize the results of a performance test on the MT8802A Radio Communication Analyzer.

Use a copy of this sheet for the performance test.

MODEL NAME _____ DATE _____
SERIAL NO. _____
Tested by _____

1. Reference oscillator frequency stability

Aging rate

Measurement item	Measured value
Reference oscillator frequency after 24-hour operation (F1) [MHz]	
Reference oscillator frequency after 48-hour operation (F2) [MHz]	
Difference between reference oscillator frequencies (F2 - F1) [MHz]	
Frequency stability = (F2 - F1)/F1 × 10^6 [ppm]	

Temperature stability

Measurement item	Measured value
Reference oscillator frequency at ambient temperature of 25°C (F25) [MHz]	
Reference oscillator frequency at ambient temperature of 50°C(F50) [MHz]	
Reference oscillator frequency at ambient temperature of 0°C (F0) [MHz]	
Difference between reference oscillator frequencies (F50 – F25) [MHz]	
Frequency stability = (F50 – F25) / F25×10^6 [ppm]	
Difference between crystal oscillator frequencies (F0 – F25) [MHz]	
Frequency stability = (F0 – F25) / F25×10^6 [ppm]	

2. Frequency/modulation measurement accuracy

Frequency [MHz]	Carrier Frequency Error				RMS Vector Error					
	Frequency measurement accuracy [kHz]				Residual vector error [%]			Modulation accuracy [%]		
	Minimum	Actual	Maximum	Measurement uncertainty	Minimum	Actual	Maximum	Minimum	Actual	Maximum
10.0	–0.010	——	+0.010	±0.000*1	0.00	——	0.70	11.55	——	13.45
100.0	–0.010	——	+0.010	±0.000*1	0.00	——	0.70	11.55	——	13.45
1000.0	–0.010	——	+0.010	±0.000*1	0.00	——	0.70	11.55	——	13.45
2000.0	–0.010	——	+0.010	±0.000*1	0.00	——	0.70	11.55	——	13.45
3000.0	–0.010	——	+0.010	±0.000*1	0.00	——	0.70	11.55	——	13.45

*1 Since the measurement-system synchronization is established by the 10 MHz standard signal, the measurement uncertainly is ±0.000 kHz.

3. Transmission power measurement accuracy

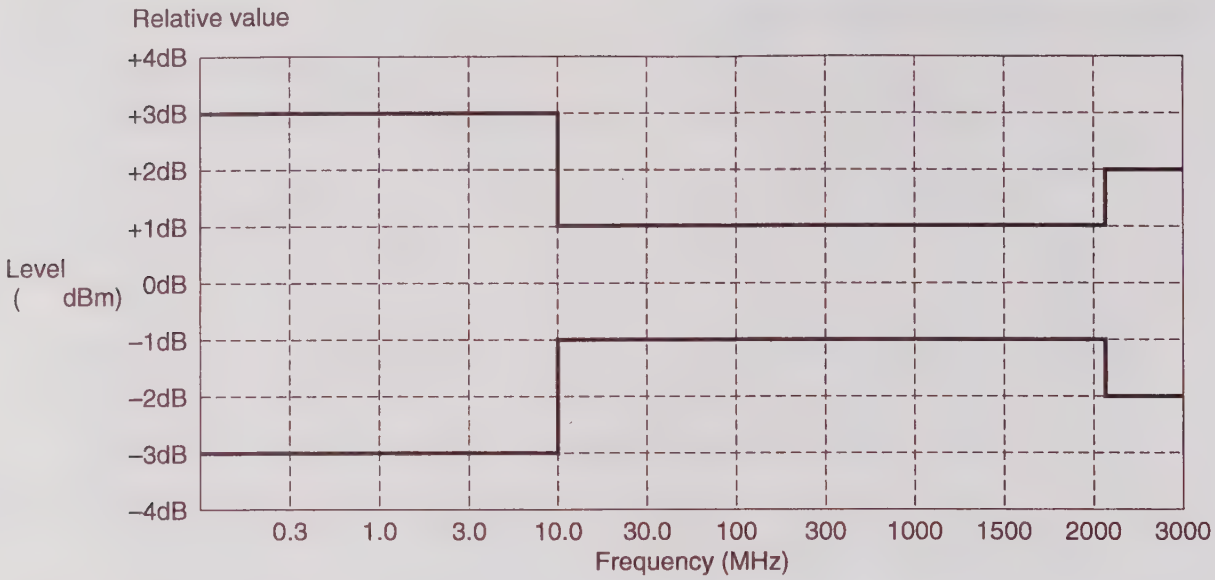
Actual power meter reading (dBm)	MT8802A TX power measured value (dBm) on Power Meter screen	MT8802A TX power measured value (dBm) on RF Power screen	Measurement uncertainty (dB)
			±0.15

4. Signal-generator frequency accuracy

Carrier frequency (F1) [MHz]	Carrier frequency measured value (F2) [MHz]	(F2-F1) [Hz]	Measurement uncertainty [Hz]
10.000000	——	——	±0.001

5. Signal-generator output level accuracy

Frequency [MHz]	0.3	1.0	3.0	10.0	30.0	100	300	1000	1500	2000	3000
Output level measured value (dBm)											
Deviation from set level (dB)											
Measurement uncertainty (dB)	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18	±0.18



6. Signal-generator modulation accuracy

Frequency (MHz)	10.0	30.0	100	300	1000	1500	2000	3000
Modulation accuracy (%rms)								
Measurement uncertainty (PDC, %)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Measurement uncertainty (PHS, %)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

SECTION 6
CALIBRATION

This section describes the measuring instruments required to calibrate the MT8802A, and the setup and calibration method for these instruments.

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(2) Instruments required for calibration 6-4

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6.1 Calibration Requirements

Calibration is done to help maintain the MT8802A's performance.

Calibration should be performed periodically even if the MT8802A is operating normally.

We recommend that the MT8802A be calibrated once or twice a year.

Contact the Service Department of Anritsu Corporation if the MT8802A fails to meet the specifications during calibration.

6.2 Equipment Required for Calibration

The table below shows the equipment required to calibrate each item.

Table 6.1 Equipment Required for Calibration

Recommended equipment	Required performance†	Calibration item
Frequency counter (MF1603A)	• 100 kHz to 3 GHz • Resolution: 1 Hz • External reference input: 10 MHz	Frequency accuracy of reference crystal oscillator
Frequency standard	Standard radio-wave receiver or equipment having equivalent function (accuracy better than 1×10^{-9})	Frequency accuracy of reference crystal oscillator

† Extracts part of performance which can cover the measurement range of the test item.

6.3 Calibration

Do not start the performance tests until the MT8802A and measuring instruments have warmed up for at least 24 hours and they have stabilized completely. To obtain the best measurement accuracy, do the calibration at room temperature. Keep AC power voltage fluctuations, noise, vibration, dust, humidity, and any other facxtors which can affect results to a minimum.

6.3.1 Calibrating the reference crystal oscillator

The stability of the MT8802A reference crystal oscillator is $\pm 2 \times 10^{-8}$/day. Calibrate the frequency of the reference crystal oscillator by using a reference signal generator generating a reference signal that is either locked to a standard wave or to the sub-carrier of a TV broadcast on a color TV (the sub-carrier will be locked to a rubidium atomic standard).

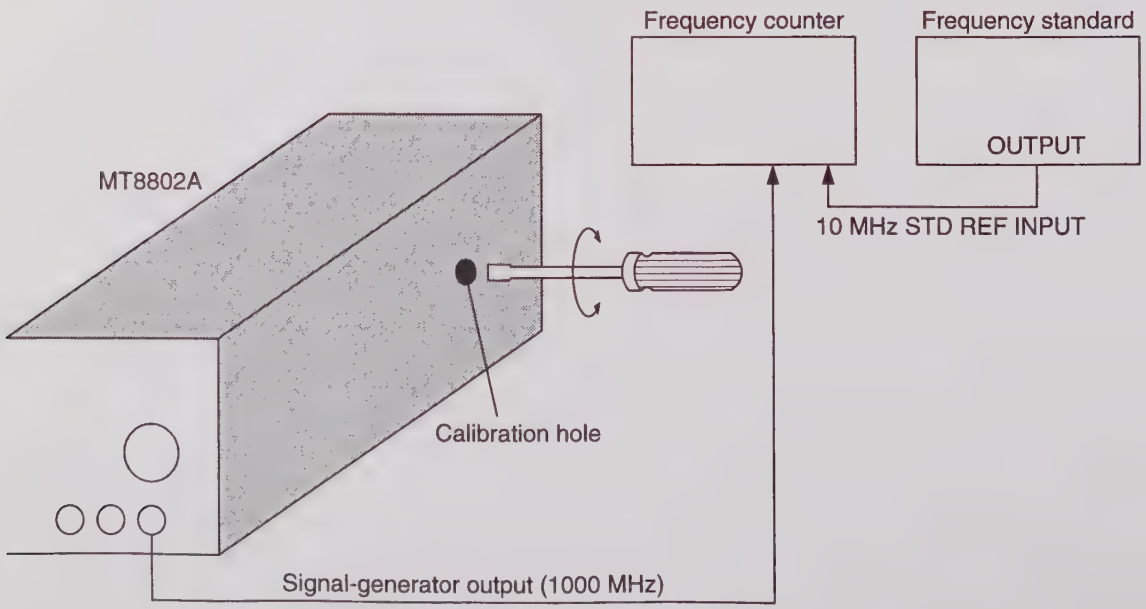
(1) Specifications

Reference oscillator	Frequency	Aging rate	Temperature characteristics
Standard type (after 24-hour operation)	10MHz	2×10^{-8}/day	$\pm 5 \times 10^{-8}$ (0°C to 50°C)

(2) Instruments required for calibration

- Frequency counter: 10 MHz external reference input, resolution: 1 Hz
- Frequency standard: Standard radio-wave receiver or equipment having equivalent function (accuracy better than 1×10^{-9})

(3) Setup



(4) Calibration procedure

Step	Procedure
1.	Setup the equipment as shown in the figure above. The ambient temperature must be 23°C ± 5°C.
2.	Set the Power switch on the rear panel to On and the Power switch on the front panel to the Standby position. Then, allow the MT8802A reference crystal oscillator to warm-up for 24 hours.
3.	Set the Power switch on the MT8802A front panel to On.
4.	Apply the standard frequency signal to the external reference input of the frequency counter.
5.	Set the frequency of the signal generator of the MT8802A to 1 000.000 000 MHz, the level to –28 dBm, and the modulation to off.
6.	Adjust the calibration trimmer of the crystal oscillator so that the frequency-counter reading is 1 000.000 000 MHz ±10 Hz.

SECTION 7
STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking, and transportation of the MT8802A and the regular maintenance procedures.

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7.3.1 Repacking 7-4

7.3.2 Transportation 7-4

7.1 Cleaning the Cabinet

Always turn the MT8802A power switch OFF and disconnect the power plug from the AC power inlet before cleaning the cabinet. To clean the external cabinet:

- Use a soft, dry cloth.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage. Then, use a soft, dry cloth to wipe the instrument dry.
- If loose screws are found, tighten them with the appropriate tools.

CAUTION ⚠

Never use benzine, thinner, or alcohol to clean the cabinet; these chemicals may damage the coating or cause deformation or discoloration.

7.2 Storage Precautions

This paragraph describes the procedures for long-term storage of the MT8802A.

7.2.1 Precautions before storage

(1) Before storage, wipe dust, finger-marks, and other contaminants off the MT8802A.

(2) Avoid storing the MT8802A where it may be exposed to:

1) Direct sunlight or high dust levels.

2) High humidity.

3) Active gasses or acid.

4) The following temperatures or humidity:

- Temperature: ..... > 60°C, < -20°C
- Humidity: ..... ≥ 90%

7.2.2 Recommended storage conditions

The recommended storage conditions are as follows:

- Temperature: ..... 0 to 30°C
- Humidity: ..... 40% to 80%
- Stable temperature and humidity over a 24-hour period.

7.3 Repacking and Transportation

Take the following precautions if the MT8802A must be returned to Anritsu Corporation for servicing.

7.3.1 Repacking

Use the original packing materials. If the MT8802A is packed in other materials, observe the following packing procedure:

(1) Wrap the MT8802A in a plastic sheet or similar material.

(2) Use a cardboard box, wooden box, or aluminum case which allows shock-absorbing material to be inserted on all sides of the MT8802A.

(3) Use enough shock-absorbing material to protect the MT8802A during transportation and to prevent it from moving in the container.

(4) Secure the container with packing straps, adhesive tape,or bands.

7.3.2 Transportation

Do not subject the MT8802A to severe vibration during transport. Also, transport under the storage conditions recommended in paragraph 7.2.

APPENDIXES

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Appendix-II.

APPENDIX A SCREEN AND FUNCTION KEY TRANSITION DIAGRAMS

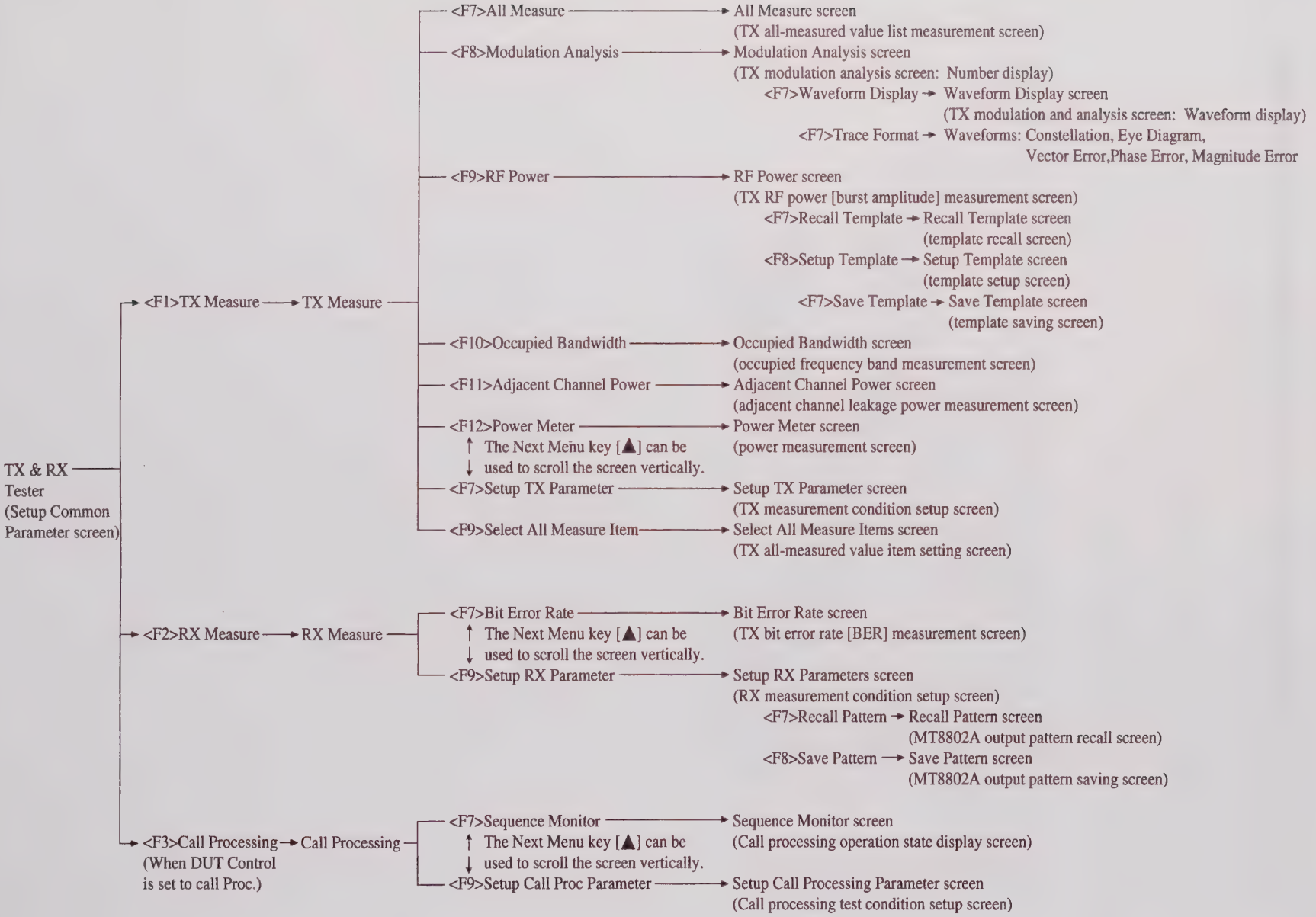
This appendix gives the screen and function-keys transition diagrams.

[Screen transitions] ..... See Paragraph 3.2.

- On any type of screen, the main menu shown below can be displayed by turning the [Main Func On Off] (F6) key to On. When main function keys F1 to F5 and Next Menu key [◀] are used to select a main menu item, the screen transits to the corresponding screen or key menu.

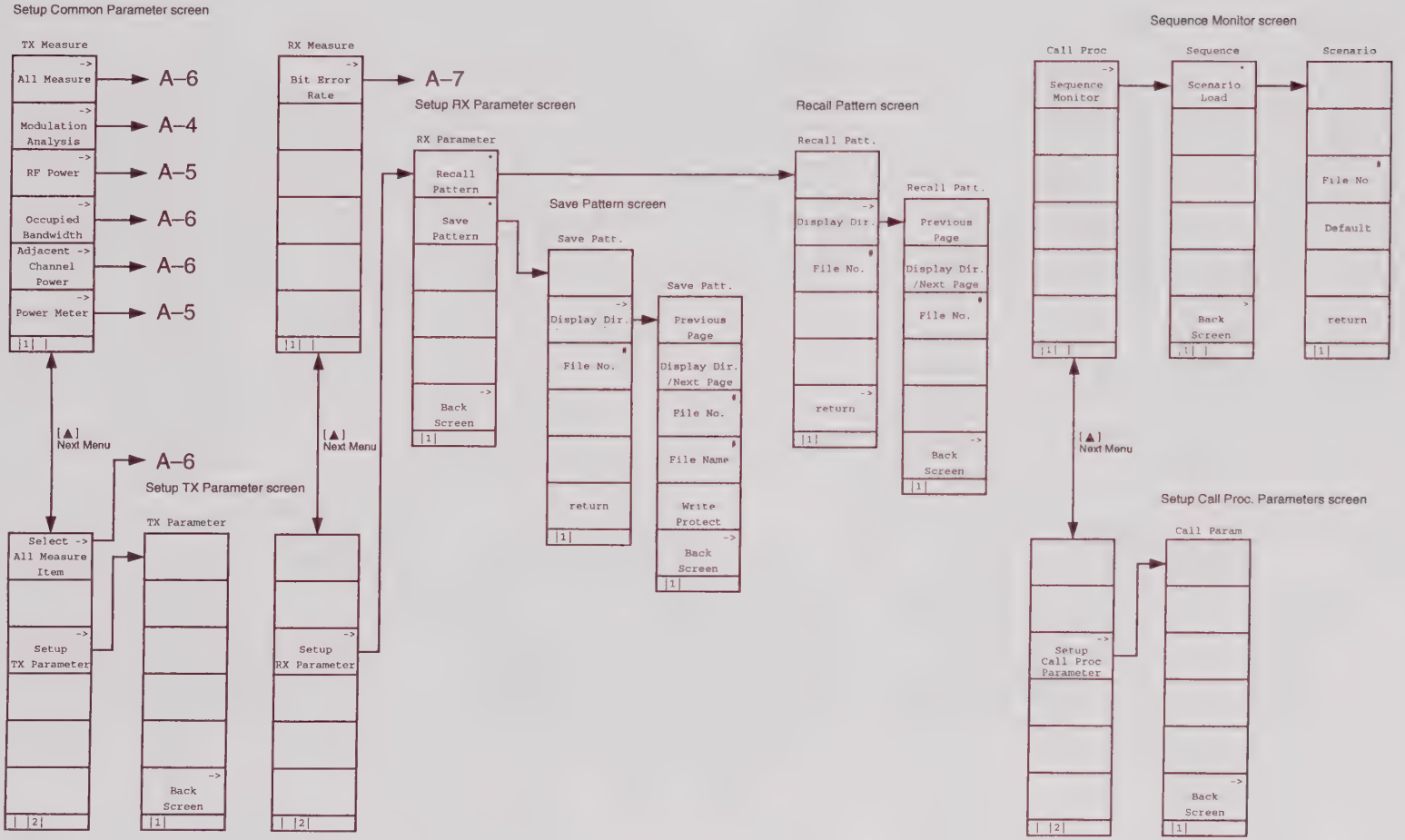
  Note: Change Color is a function key menu, so there is no corresponding screen.

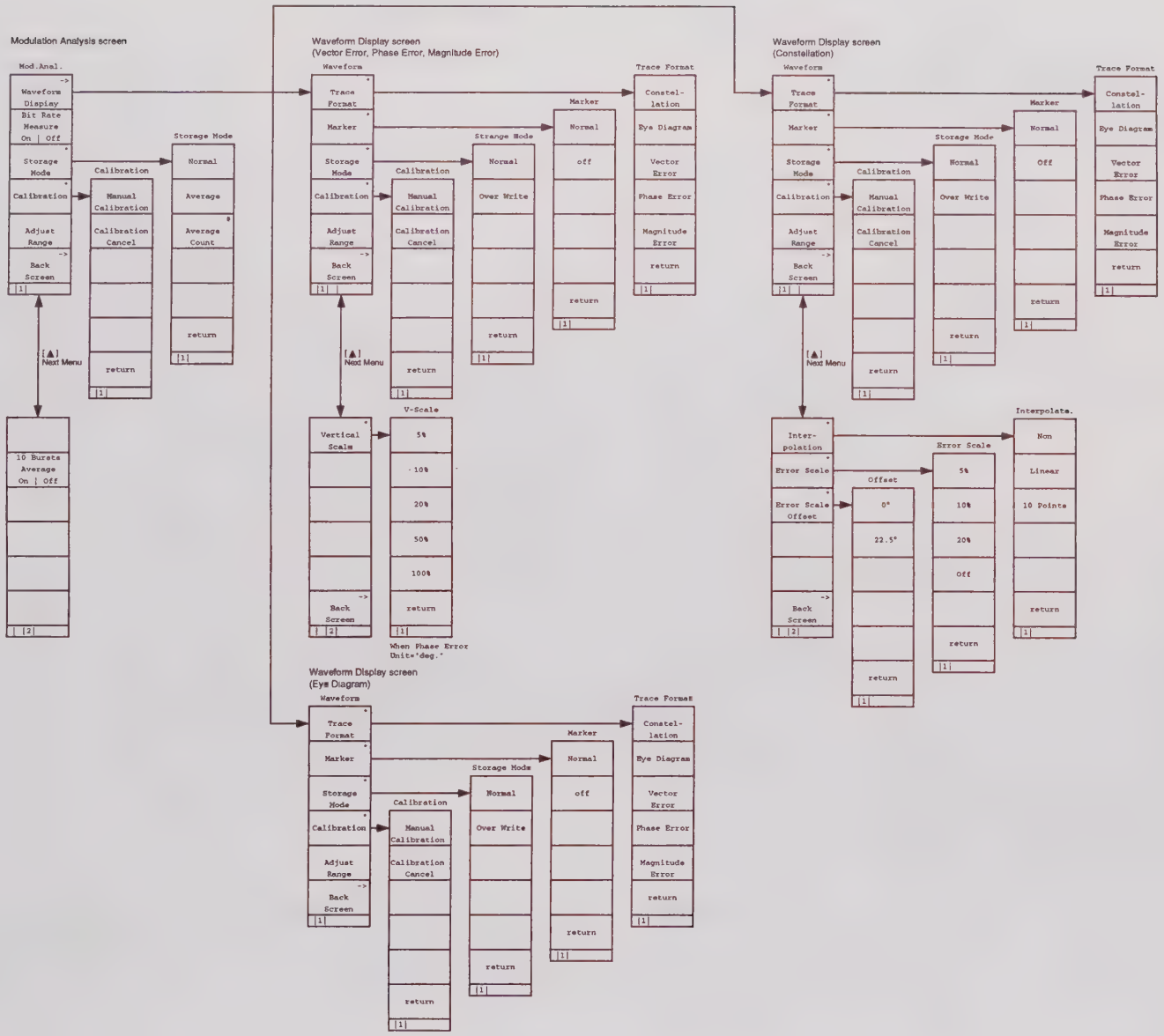
<F1>TX&RX Tester ——→ Setup Common Parameter screen
<F4>Recall ——→ Recall Parameter screen
<F5>Save ——→ Save Parameter screen
↑ (The screen can be scrolled vertically
↓ using the Next Menu key [◀].)
<F1>Change System ——→ Change System screen
<F2>Instrument Setup ——→ Instrument Setup screen
<F3>Change Color ——→ Change Color menu
<F4>File Operation ——→ File Operation screen

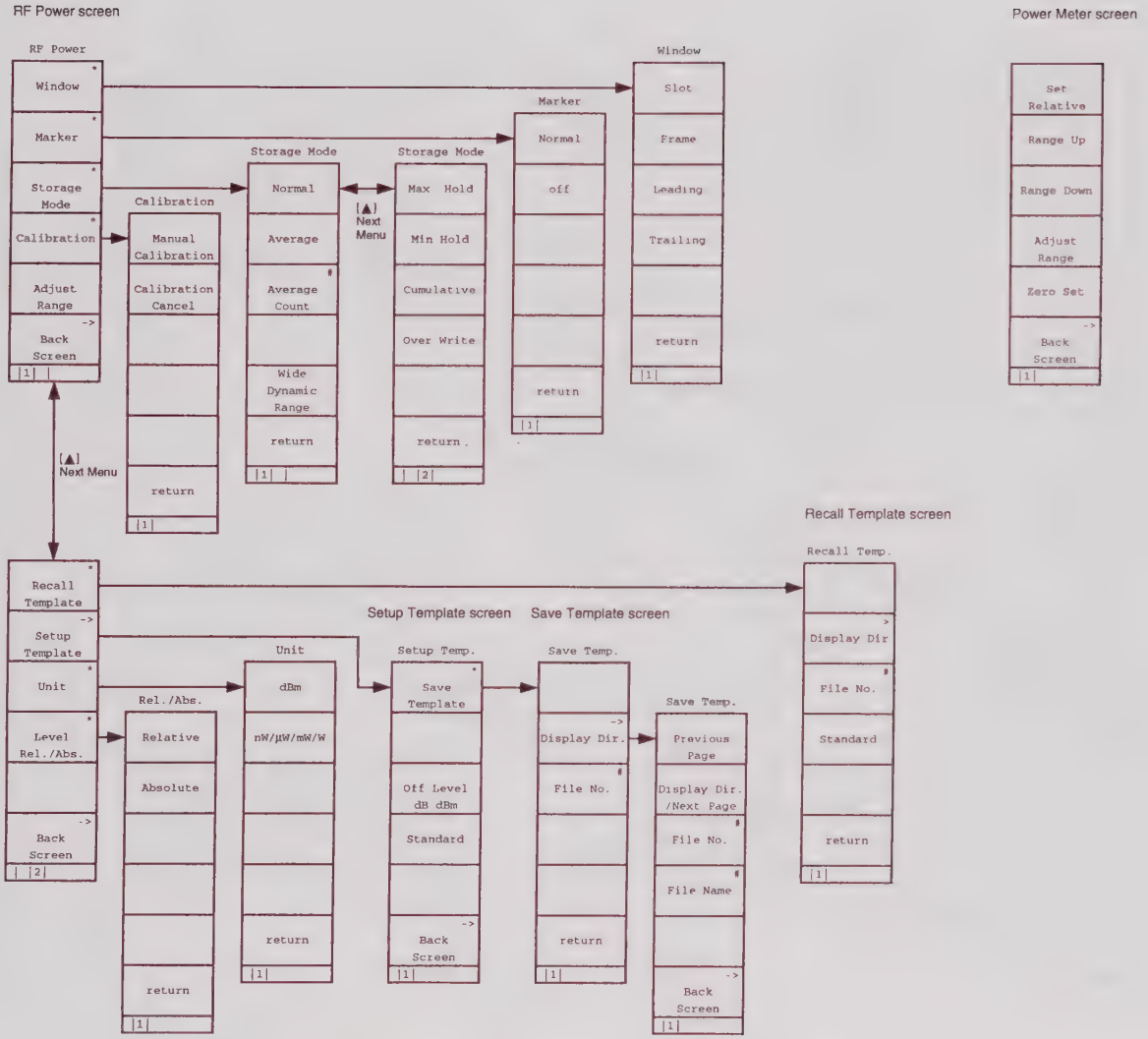

TX & RX Tester (Setup Common Parameter screen)
<F1>TX Measure → TX Measure
<F7>All Measure → All Measure screen (TX all-measured value list measurement screen)
<F8>Modulation Analysis → Modulation Analysis screen (TX modulation analysis screen: Number display)
<F7>Waveform Display → Waveform Display screen (TX modulation and analysis screen: Waveform display)
<F7>Trace Format → Waveforms: Constellation, Eye Diagram, Vector Error,Phase Error, Magnitude Error
<F9>RF Power → RF Power screen (TX RF power [burst amplitude] measurement screen)
<F7>Recall Template → Recall Template screen (template recall screen)
<F8>Setup Template → Setup Template screen (template setup screen)
<F7>Save Template → Save Template screen (template saving screen)
<F10>Occupied Bandwidth → Occupied Bandwidth screen (occupied frequency band measurement screen)
<F11>Adjacent Channel Power → Adjacent Channel Power screen (adjacent channel leakage power measurement screen)
<F12>Power Meter → Power Meter screen (power measurement screen)
↑ The Next Menu key [▲] can be used to scroll the screen vertically.
<F7>Setup TX Parameter → Setup TX Parameter screen (TX measurement condition setup screen)
<F9>Select All Measure Item → Select All Measure Items screen (TX all-measured value item setting screen)
<F2>RX Measure → RX Measure
<F7>Bit Error Rate → Bit Error Rate screen (TX bit error rate [BER] measurement screen)
↑ The Next Menu key [▲] can be used to scroll the screen vertically.
<F9>Setup RX Parameter → Setup RX Parameters screen (RX measurement condition setup screen)
<F7>Recall Pattern → Recall Pattern screen (MT8802A output pattern recall screen)
<F8>Save Pattern → Save Pattern screen (MT8802A output pattern saving screen)
<F3>Call Processing → Call Processing
(When DUT Control is set to call Proc.)
<F7>Sequence Monitor → Sequence Monitor screen (Call processing operation state display screen)
↑ The Next Menu key [▲] can be used to scroll the screen vertically.
<F9>Setup Call Proc Parameter → Setup Call Processing Parameter screen (Call processing test condition setup screen)

[Function key transitions on various screens]

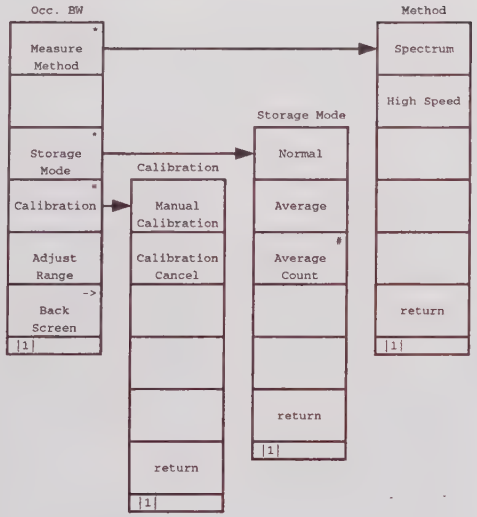
Note: If [F12], [Back Screen], or [return] displayed at the bottom of the function key is selected, the screen returns to the upper hierarchy.



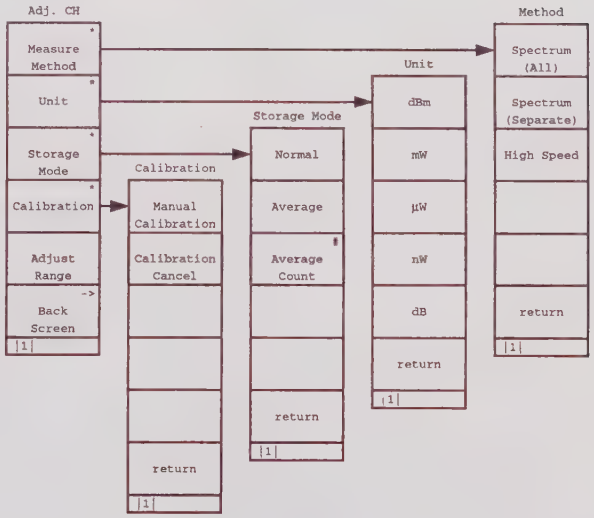

Modulation Analysis screen
Mod.Anal.
Waveform Dispiay
Bit Rate Measure On | Off
Storage Mode
Calibration
Adjust Range
Back Screen
Calibration
Manual Calibration
Calibration Cancel
return
Storage Mode
Normal
Average
Average Count
return
[▲] Next Menu
10 Bursts Average On | Off
Waveform Display screen
(Vector Error, Phase Error, Magnitude Error)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Marker
Normal
off
return
Strange Mode
Normal
Over Write
return
Trace Format
Constel-lation
Eye Diagram
Vector Error
Phase Error
Magnitude Error
return
[▲] Next Menu
Vertical Scale
V-Scale
5%
10%
20%
50%
100%
return
When Phase Error Unit='deg.'
Waveform Display screen
(Eye Diagram)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Marker
Normal
off
return
Storage Mode
Normal
Over Write
return
Calibration
Manual Calibration
Calibration Cancel
return
Trace Format
Constel-lation
Eye Diagram
Vector Error
Phase Error
Magnitude Error
return
Waveform Display screen
(Constellation)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Marker
Normal
Off
return
Storage Mode
Normal
Over Write
return
Calibration
Manual Calibration
Calibration Cancel
return
Trace Format
Constel-lation
Eye Diagram
Vector Error
Phase Error
Magnitude Error
return
[▲] Next Menu
Inter-polation
Error Scale
Error Scale Offset
Back Screen
Offset
0°
22.5°
return
Error Scale
5%
10%
20%
Off
return
Interpolate.
Non
Linear
10 Points
return


RF Power screen
RF Power
Window
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Calibration
Manual Calibration
Calibration Cancel
return
Storage Mode
Normal
Average
Average Count
Wide Dynamic Range
return
[▲] Next Menu
Storage Mode
Max Hold
Min Hold
Cumulative
Over Write
return
Marker
Normal
off
return
Window
Slot
Frame
Leading
Trailing
return
[▲] Next Menu
Power Meter screen
Set Relative
Range Up
Range Down
Adjust Range
Zero Set
Back Screen
Recall Template screen
Recall Template
Setup Template
Unit
Level Rel./Abs.
Back Screen
Rel./Abs.
Relative
Absolute
return
Unit
dBm
nW/µW/mW/W
return
Setup Template screen
Setup Temp.
Save Template
Off Level dB dBm
Standard
Back Screen
Save Template screen
Save Temp.
Display Dir.
File No.
return
Save Temp.
Previous Page
Display Dir. /Next Page
File No.
File Name
Back Screen
Recall Temp.
Display Dir
File No.
Standard
return

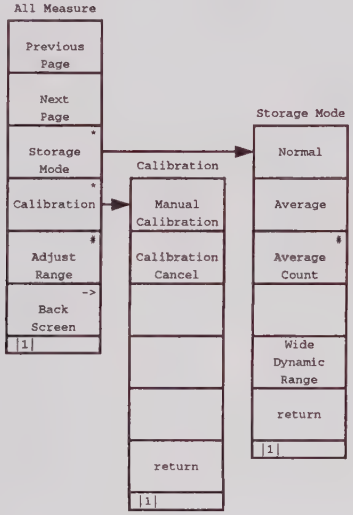
Occupied Bandwidth screen



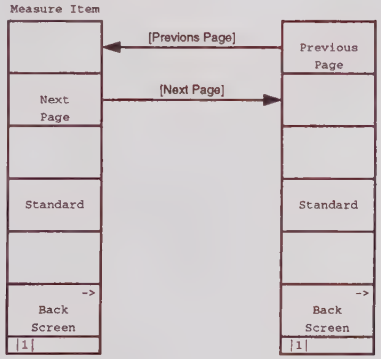
Adjacent Channel Power screen



TX All Measure screen



Select All Measure Item screen

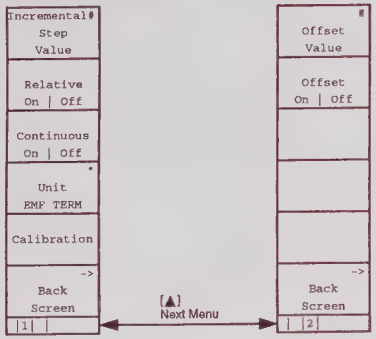


Bit Error Rate screen

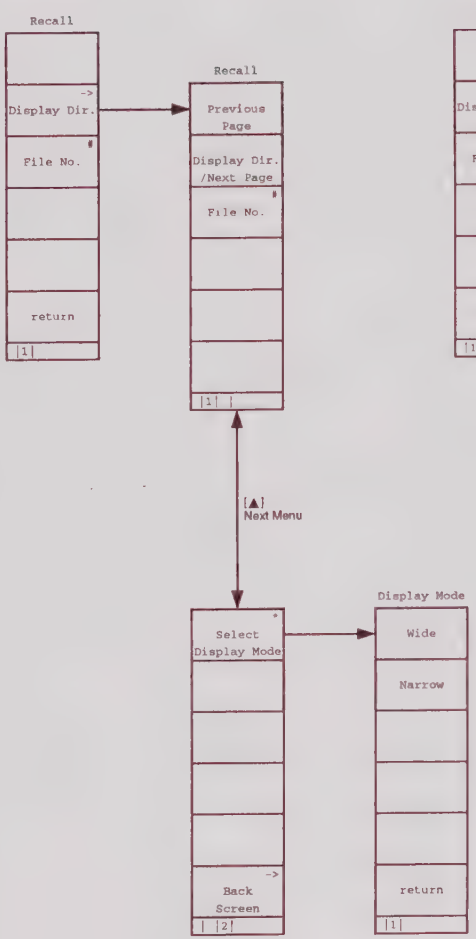
When <F1> Measure is selected

When <F2> Frequency is selected

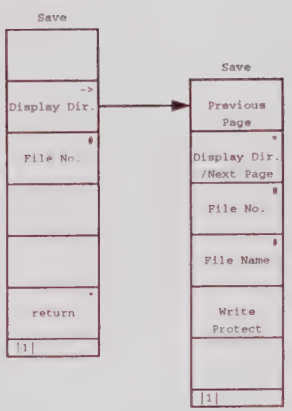
When <F3> Level is selected



Recall screen

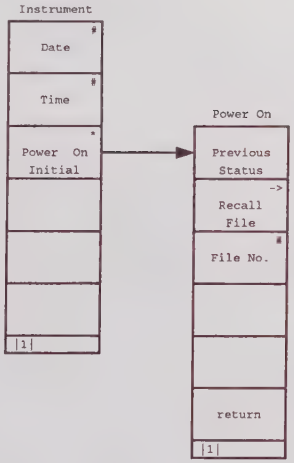


Save screen

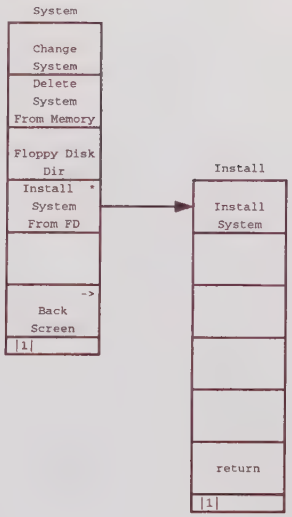


File Operation screen

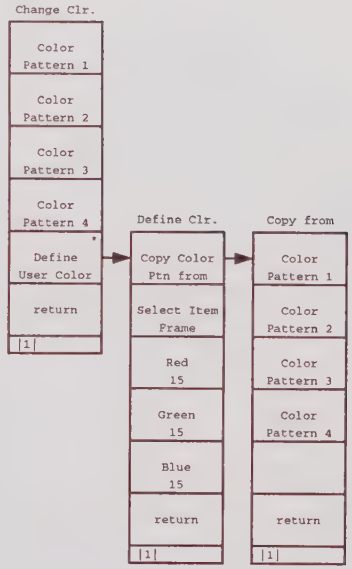
Instrument Setup screen



Change System screen



Change Color menu



APPENDIX B INITIAL VALUES

- The initial value is the value set at factory shipping.
- Items marked with an asterisk (*) is not displayed or selected by default.
- "PS" in the "Initialization" column on the rightmost on the table indicates the item that is initialized with the [Preset] key on the front panal or PRE/INI of the remote control commands.
  "PW" indicates the item initialized with the *RST of the remote control command.
  Items initialized with the PRE/INI commands can also be initialized with the *RST command.
- Items not initialized with those commands above are indicated as "NO."

- Change System screen
  No initial values

• Instrument Setup screen

Item	Initial value	Initialization
Frequency		
Reference Frequency	10MHz	PW
RF Input/Output	Main	PW
Display		PW
Display Title	User Define	PW
Clock Display	YY/MM/DD (Year, Month, Day)	PW
Interface		
Connect to Controller	GPIB	No
GPIB		
Address	01	No
RS232C		
Baud Rate	2400	No
Parity	Even	No
Data Bit	8bits	No
Stop Bit	1bit	No
Hard Copy		
Output Davice	Printer (Parallel)	PW
Type	ESC/P	PW
Alarm	On	PW
[Power On Initial] F9:	Previous Status	No
[File No.] F9	0	No

• Change Color menu

Item	Initial value	Initialization
Change Clr. menu	Color Pattern 1	No
[Define User Color] F11		No

• Setup Common Parameter screen

Item	Initial value	Initialization
DUT Control	None	PW
Traffic Channel		
Band	800 MHz–1	PW
Channel	1	PW
TX Measure Frequency	940.025 MHz	PW
RX Measure Frequency	810.025 MHz	PW
Control Channel		
Band	800 MHz	PW
Channel	1	PW
Level		
TX Measure Reference Level	30 dBm	PW
RX Measure Output Level	–55 dBm	PW
MS Power Level	3.0 W–4 dB/2.0W	PW
Signal		
Measuring Object	MS-TCH	PW
-When Measuring Object is MS-TCH.-		
Channels per Carrier	Full Rate	PW
Slot Number	0	PW
Sync Word Pattern	S1	PW
Color Code	01	PW
Scramble	On	PW
Scramble Code	01	PW
Tch Pattern	PN9	PW
Time Alignment	Reference	PW
-When Measuring Object is Continuous.-		
Pattern	PN9	PW

• Setup TX Measure Parameter screen

Item	Initial value	Initialization
Measurement Trigger	SW	PW
User Cal Factor Band1, Band2	0.00 dB	PW
RCR-STD27	C	PW

• Select All Measure Item screen

Item	Initial value					Initialization
	Measurement	Unit	Judge	Lower	Upper	
1st page						
10 Bursts Average	Off					PW
Modulation Analysis						
Frequency	On	(MHz)				PW
Frequency Error	On	ppm	On		±3.0 ppm	PW
RMS Vector Error	On	(%)	On		12.5 %	PW
Peak Vector Error	Off	(%)	Off		25.0 %	PW
Magnitude Error	Off	(%)	Off		12.5 %	PW
Phase Error	Off	(deg)	Off		10.0 deg.	PW
Origin Offset	Off	(dB)	Off		–20.0 dB	PW
Bit rate Error	On	(ppm)	On		±5.0 ppm	PW
RF Power						
TX Power	On	W	On	0.400 W	0.960 W	PW
Carrier Off Power	On	dBm	On		–60.0 dBm	PW
On/Off Ratio	On	(dB)	On	60.0 dB		PW
Burst Timing	Off	(symbol)	Off	–0.12 symbol	0.12 symbol	PW
Rising Time	Off	(μs)	Off	0.0 μs	143 μs	PW
Falling Time	Off	(μs)	Off	0.0 μs	143 μs	PW
Template Pass/Fail	Off					
Template	On					
2nd page						
Occupied Bandwidth						
Measure Method	High Speed					PW
Occupied Bandwidth	On	(kHz)	On		32.000 kHz	PW
Lower Limit	Off	(kHz)	Off	–16.000 kHz		PW
Upper Limit	Off	(kHz)	Off		–16.000 kHz	PW
Adjacent Channel Power						
Measure Method	High Speed					PW
Lower2 (–100 kHz)	On	dB	On		–60.0 dB	PW
Lower1 (–50 kHz)	On	dB	On		–45.0 dB	PW
Upper1 (50 kHz)	On	dB	On		–45.0 dB	PW
Upper2 (100 kHz)	On	dB	On		–60.0 dB	PW

• All Measure screen

Item	Initial value	Initialization
[Storage Mode] F9:	Normal mode	PS
[Average Count] F9:	10	PS

• Modulation Analysis screen

Item	Initial value	Initialization
[Storage Mode] F9:	Normal mode	PS
[Average Count] F9	10	PS

• Waveform Display screen

Item	Initial value	Initialization
[Marker] F8	Off mode	
[Normal] F7	69.0 symbol	PS
[Storage Mode] F9	Normal mode	PS
(For Constellation waveform display)		
[Interpolation] F7	Non mode	PS
[Error Scale] F8	Off mode	PS
[Error Scale Offset] F9	0° mode	PS
(For Vector-Error/Phase-Error/Magnitude-Error waveform displays)		
[Vertical Scale] F8		
(Vector Error, Magnitude Error)	20 %	PS
(Phase Error)	20 deg.	PS

• RF Power screen, Recall Template screen

Item	Initial value	Initialization
1st pager		
[Window] F7	Slot	PS
[Marker] F8	Off mode	PS
[Normal] F7	The screen center: 69.00 symbol	PS
[Storage Mode] F9	Normal mode	PS
[Average Count] F9	10	PS
2nd page		
[Setup Template] F7	Standard mode	PW
[File No.] F9	0	–
[Unit] F9	dBm	PS
[Level Rel./Abs.] F10	Relative	PS

• Setup Template screen

Item	Initial value	Initialization
Line Level		
1	–70.0 dB	PW
2	–60.0 dB	PW
3	4.0 dB	PW
4	–60.0 dB	PW
5	–70.0 dB	PW
[Off Level dB dBm] F9	dB	PW

• Save Template screen

Item	Initial value	Initialization
[Save Template] F7		
[File No.] F9	0	–

• Occupied Bandwidth screen

Item	Initial value	Initialization
[Measure Method] F7	High Speed method	PS
[Storage Mode] F9	Normal mode	PS
[Average Count] F9	10	PS

• Adjacent Channel Power screen

Item	Initial value	Initialization
Function key:		
[Measure Method] F7	High Speed method	PS
[Spectrum (All) Mkr: On|Off] F7	Off	PS
[Unit] F8	dBm	PS
[Storage Mode] F9	Normal mode	PS
[Average Count] F9	10	PS

• Power Meter screen

Item	Initial value	Initialization

• Setup RX Measure Parameter sereen, Recall Pattern screen, Save Pattern screen

Item	Initial value	Initialization
BER Measure		
Input Data	Positive	PW
Input Data Clock	Rise	PW
Frame Structure	Frame	PW
Differential Phase Encode	Normal	PW
User Cal Factor Band1, Band2	0.0 dB	PW
[Recall Pattern] F7		
[Display Dir] F8		
[File No.] F9	0	–
[File No.] F9	0	–
[Save Pattern] F8		
[Display Dir] F8		
[File No.] F9	0	–
[File No.] F9	0	–

• Bit Error Rate screen

Item	Initial value	Initialization
[RF Level On Off] F4	Off	PS
[Modulation On Off] F5	Off	PS
–Measure menu–		
[Counting Time] F7	10000	PS
[Start/Stop] F8	Stop	PS
–Frequency menu–		
[Incremental Step Value] F7	1 MHz	PS
[Relative On Off] F8	Off	PS
–Level menu–		
1st page		
[Incremental Step Value] F7	1 dB	PS
[Relative On Off] F8	Off	PS
[Continuous On Off] F9	Off	PS
[Unit EMF TERM] F10:	EMF	PS
2nd page		
[Offset Value] F7	0 dB	PS
[Offset On Off] F8	Off	PS

• File Operation screen

Item	Initial value	Initialization
1st page		
[Delete File] F11	0	–

• Setup Call Proc. Parameter screen

Item	Initial value	Initialization
Network ID		
Country Number	1	PW
Operator Group Number	0	PW
Network Identity in Group	0	PW
CCH Color Code	01	PW
Location ID	0	PW
Paging MSI	Auto	PW
MSI	0123456789012345	PW

• Sequence Monitor screen

No initial values

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SECTION 1
GENERAL

This section outlines the Remote Control functions of the MT8802A Radio Communication Analyzer.

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1.1 General Description

The MT8802A Radio Communication Analyzer, when combined with an external controller, can automate your measurement system. For this purpose, the MT8802A is equipped with an RS-232C interface port and a GPIB interface bus (IEEE Std 488.2-1987) as a standard feature.

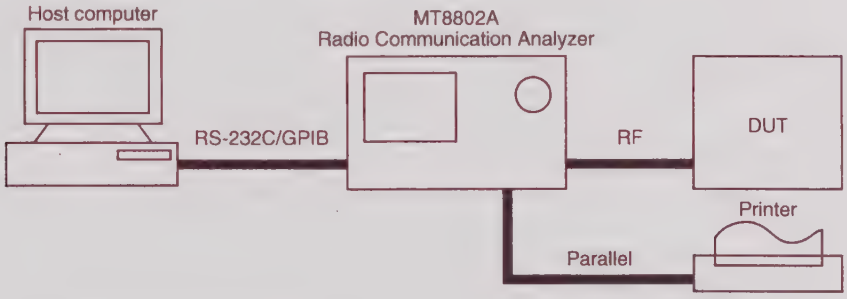
1.2 Remote Control Functions

The Remote Control functions of the MT8802A are as follows:

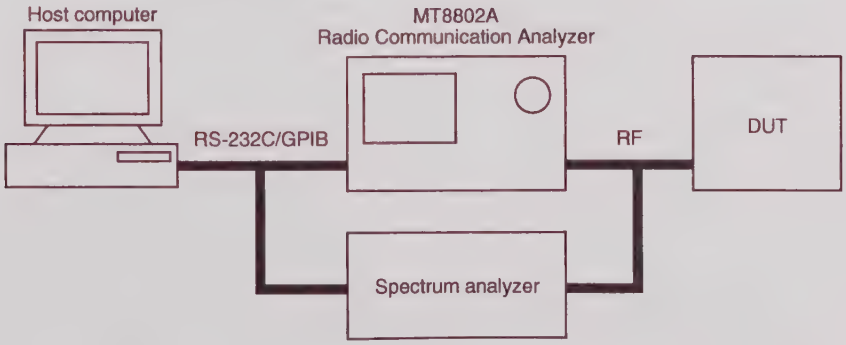
(1) Controls all functions except the power switch, floppy disk unloading , and some keys including the [Local] key
(2) Reads out all setting conditions
(3) Sets the RS-232C interface conditions and GPIB address from the panel
(4) Executes interrupts and serial polling
These functions enable to configure the automatic measurement system when the MT8802A is combined with a personal computer and other measuring instruments

1.3 Example of System Configuration Using RS-232C/GPIB

(1) Control by the host computer (1)



(2) Control by the host computer (2)



1.4 RS-232C Specifcations

The RS-232C specifications of the MT8802A are shown in the table below.

Item	Specification
Function	Control from an external controller (except power switch)
Communication system	Asynchronous (start-stop method), half-duplex
Communication control	X-ON/OFF control
Baud rate	1200, 2400, 4800, 9600 bps
Data bits	7 bits, 8 bits
Parity	Odd, Even, None
Start bit	1 bit
Stop bit	1 bit, 2 bits
Connector	D-sub 9 pins, female

1.5 GPIB Specifications

The GPIB of the MT8802A provides the IEEE488.1 interface function subsets listed in the table below.

GPIB Interface Functions

Code	Interface function
SH1	All source handshake functions are provided. Synchronizes the timing of data transmission.
AH1	All acceptor handshake functions are provided. Synchronizes the timing for receiving data.
T6	Synchronizes the timing for receiving data. The serial poll function is provided. The talk-only function is not provided. The talker can be canceled by MLA.
L4	Basic listener functions are provided. The listen-only function is not provided. The listener can be canceled by MTA.
SR1	All service request and status byte functions are provided.
RL1	All remote/local functions are provided. The local lockout function is provided.
PP0	Parallel poll functions are not provided.
DC1	All device clear functions are provided.
DT1	The device trigger function is provided.
C0	Controller functions are not provided.

SECTION 2
DEVICE MESSAGES

This section outlines and lists the device messages of the MT8802A.

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2.1 General Description

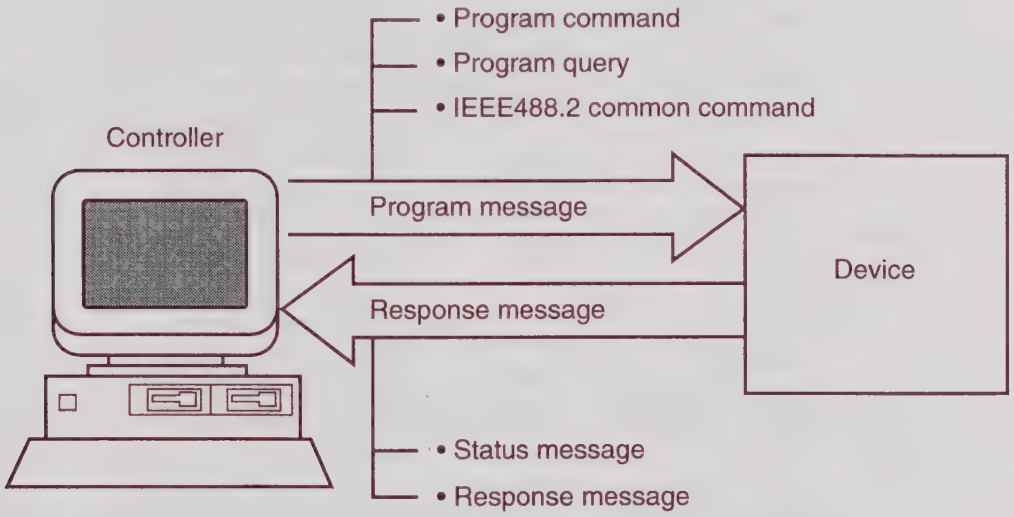
A device message is a data message transmitted between the controller and device via the system interface. Device messages are classified into program messages and response messages.

A program message is an ASCII data message transferred from the controller to the device. Program messages are classified into program commands and program queries.

Program commands are classified into device-specific commands used exclusively to control the MT8802A, and IEEE488.2 common commands. IEEE488.2 common commands are also used for other measuring instruments conforming to IEEE488.2 connected to the bus.

A program query is a command used to obtain a response message from the device. It is transferred from the controller to the device in advance, then the controller receives the response message from the device.

A response message is an ASCII data message transferred from the device to the controller.



Program messages and response messages may have a suffix (units) at the end of the numeric data.

2.2 Suffix Code

The table below shows the suffixes used for the MT8802A.

MT8802A Suffix Codes

Type	Unit	Suffix code
Frequency	GHz	GHZ, GZ
	MHz	MHZ, MZ
	kHz	KHZ, KZ
	Hz	HZ
	Default	HZ
Time	second	S
	m second	MS
	μsecond	US
	Default	MS
Level (dB)	dB	DB
	dBm	DBM, DM
	dBμ	DBU
	Default	Determined in conformance with the set scale unit
Level (W)	W	W
	mW	MW
	μW	UW
	nW	NW
	Default	UW

2.3 IEEE488.2 Common Commands and Supported Commands

The table below lists 39 common commands specified in the IEEE488.2 standard. IEEE488.2 common commands which are supported by the MT8802A are indicated with the ◎ symbol in the table.

Mnemonic	Command name	IEEE488.2 standard	MT8802A supported commands
*ADD	Accept Address Command	Optional	
*CAL	Calibration Query	Optional	
*CLS	Clear Status Command	Mandatory	◎
*DDT	Define Device Trigger Command	Optional	
*DDT?	Define Device Trigger Query	Optional	
*DLF	Disable Listenner Function Command	Optional	
*DMC	Define Macro Command	Optional	
*EMC	Enable Macro Command	Optional	
*EMC?	Enable Macro Query	Optional	
*ESE	Standard Event Status Enable Command	Mandatory	◎
*ESE?	Standard Event Status Enable Query	Mandatory	◎
*ESR?	Standard Event Status Register Query	Mandatory	◎
*GMC?	Get Macor contents Query	Optional	
*IDN?	Identification Query	Mandatory	◎
*IST?	Individual Status Query	Optional	
*LMC?	Learn Macro Query	Optional	
*LRN?	Learn Device Setup Query	Optional	
*OPC	Operation Complete Command	Mandatory	◎
*OPC?	Operation Complete Query	Mandatory	◎
*OPT?	Option Identification Query	Optional	
*PCB	Pass Control Back Command	Mandatory if other than C0	
*PMC	Purge Macro Command	Optional	
*PRE	Parallel Poll Register Enable Command	Optional	
*PRE?	Parallel Poll Register Enable Query	Optional	
*PSC	Power On Status Clear Command	Optional	
*PSC?	Power On Status Clear Query	Optional	
*PUD	Protected User Data Command	Optional	
*PUD?	Protected User Data Query	Optional	
*RCL	Recall Command	Optional	
*RDT	Resource Description Transfer Command	Optional	
*RDT?	Resource Description Transfer Query	Optional	
*RST	Reset Command	Mandatory	◎
*SAV	Save Command	Optional	
*SRE	Service Request Enable Command	Mandatory	◎
*SRE?	Service Request Enable Query	Mandatory	◎
*STB?	Read Status Byte Query	Mandatory	◎
*TRG	Trigger Command	Mandatory if DT1	◎
*TST?	Self Test Query	Mandatory	◎
*WAI	Wait to Continue Command	Mandatory	◎

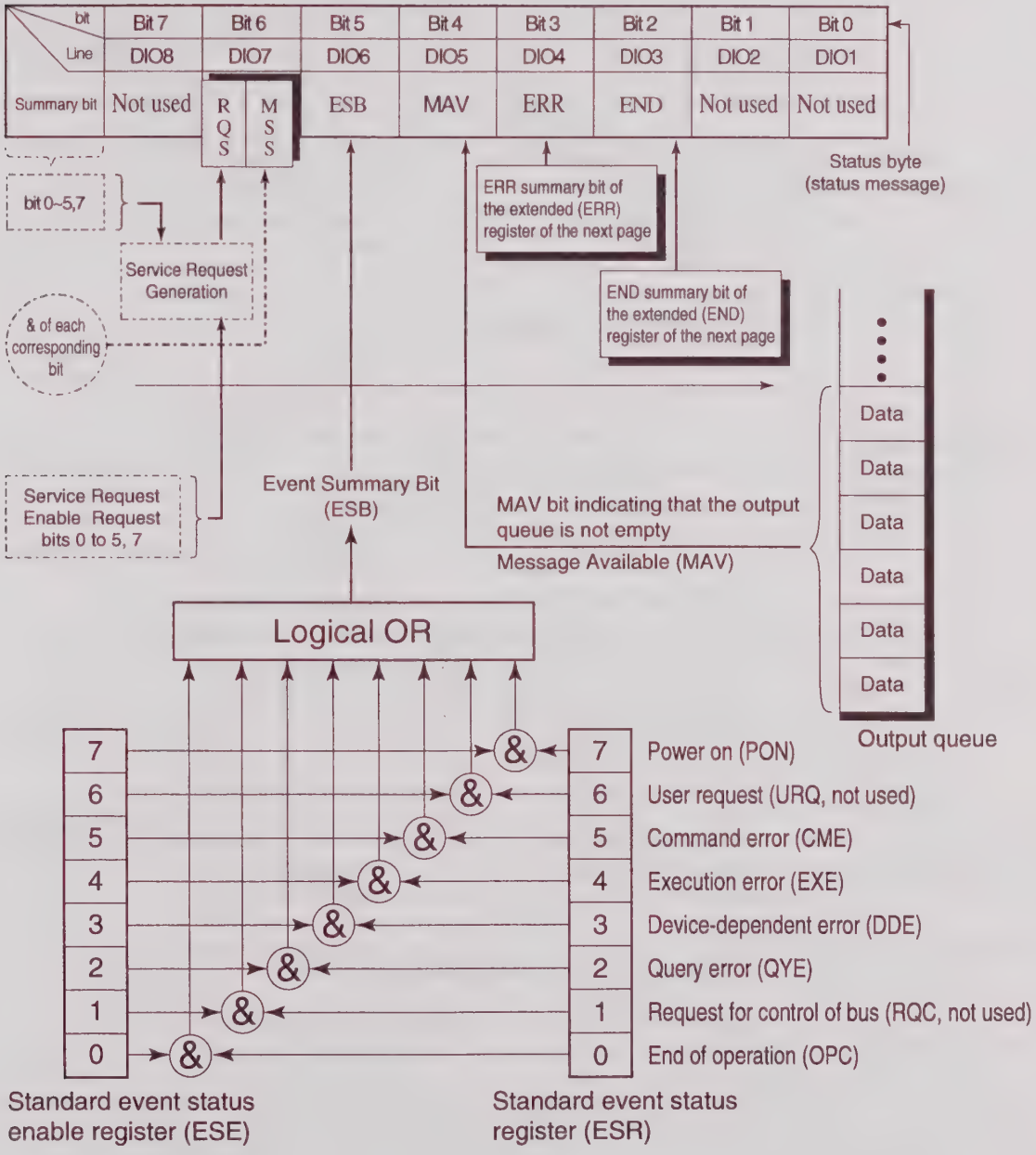
Note:The first character of IEEE488.2 common commands is always *.

Table below lists the IEEE488.2 common commands used in the MT8802A.

IEEE488.2 common command				
Command name	Program Msg.	Query Msg.	Response Msg.	Remarks
Clear status	*CLS	– – –	– – –	
Standard event status enable	*ESE n	*ESE?	n	n:0 to 255
Standard event status register	– – –	*ESR?	n	n:0 to 255
Identification query	– – –	*IDN?	id	ID:Manufacturer name, model name, etc.
Operation complete	*OPC	*OPC?	1	
Reset	*RST	– – –	– – –	
Service request enable	*SRE	*SRE?	n	"n:0 to 63, 128 to 191"
Read status byte	– – –	*STB?	n	
Trigger	*TRG	– – –	– – –	
Self test	– – –	*TST?	n	
Wait to continue	*WAI	– – –	– – –	

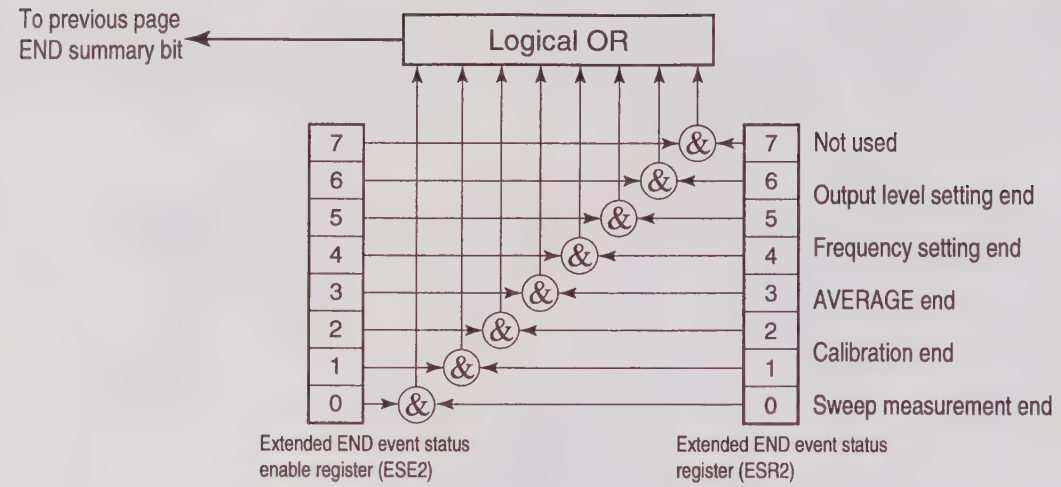
2.4 Status Messages

The diagram below shows the structure of service-request summary messages for the status byte register (STB) used with the MT8802A.

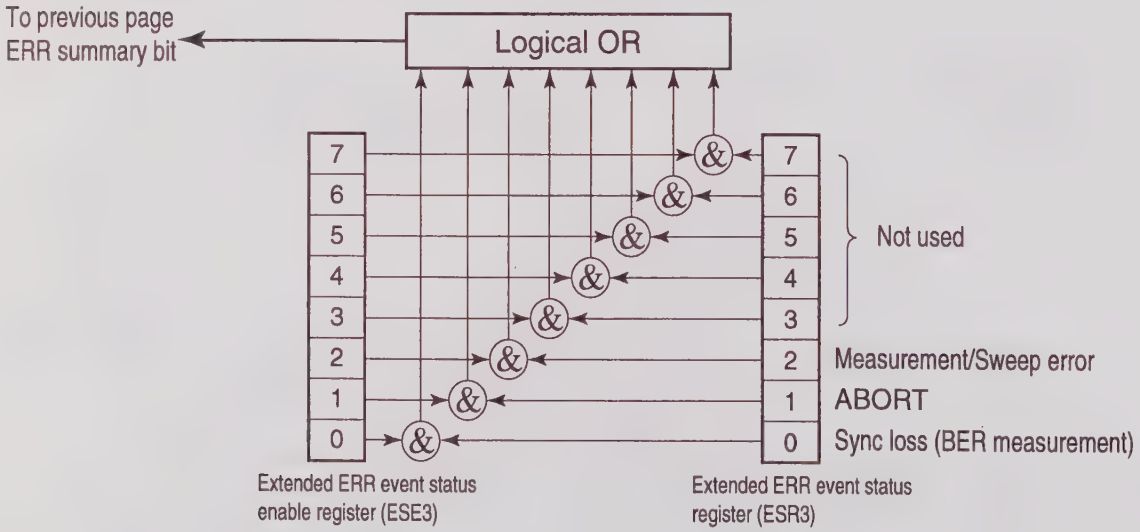


Standard Event Status (STB) Register

Note: & indicates a logical product (AND).



Extended Event Status (END) Register



Extended Event Status (ERR) Register

2.5 Device Message List

MT8802A-specific program commands, query messages, and response messages are listed from paragraph 2.5.1.

• Device message table

(a)Program messages (Program Msg)/query message (Query Msg)

(i) Uppercase characters : Reserved words
(ii) Numeric : Reserved words (numeric code)
(iii) Lowercase characters in argument

f (frequency) : Real number or integer with decimal point
Units : GHZ, MHZ, KHZ, HZ, GZ, MZ, KZ, no units = HZ
t(time) : Real number or integer with decimal point
Units : S, SC, MS, US, no unit = US
ℓ (level) : Real number or integer with decimal point
Units : DB, DBM, DM, DBU, W, MW, UW, NW, no units = set SCALE units
n (no units integer) : Integer
r (no units real number) : Real number
h (no units hexadecimal number) : Hexadecimal number
Others : Listed in remarks columns of the table

(b)Response messages (Response Msg)

(i) Uppercase characters : Reserved words
(ii) Numeric : Reserved words (numeric code)
(iii) Lowercase characters in argument
f (frequency) : 12-character fixed integerunits = HZ
t (time) : Real number or integer with decimal point
ℓ (level) : Real number or integer with decimal point
u (ratio) : Real number or integer with decimal point
s (symbol) : Real number or integer with decimal point
n (no units integer) : Integer, variable number of digits (Significant digits are output.)
r (no units real number) : Real number with decimal point, variable number of digits (Significant digits are output.)
h (no units hexadecimal number) : Hexadecimal number
Others : Written in remarks columns of the table

Notes: • Integer:NR1 format, real number:NR2 format
• Ø/:Zero

Device messages are classified into 7 types according to their valid ranges:

1.MT8802A common commands	:	Valid in all MT8802A modes
2.Instrument Setup command	:	Valid in Instrument Setup panel mode
3.TX/RX tester commands	:	Valid in TX/RX tester panel mode (on all TX/RX test screens)
4.Setup command parameter command	:	Valid on the Setup common parameter screen
5.TX tester commands	:	Valid in a range defined on each TX test screen
6.RX tester commands	:	Valid in a range defined on each RX test screen
7. Call Processing commands	:	Valid in a range defined on each Call Processing screen

These device messages are listed below.

• Relationship between screen hierarchies and commands

[MT8802A common commands]:Valid in all MT8802A modes regardless of screen hierarchies

Save/Recall command
FD command (Verify)
Copy command
Single/Continuous switching command
Preset command
Waveform memory read command
Switch to upper screen command (BS: Back Screen)
Extended event status command (END, ERR)

[Screen hierarchies and commands]

Panel mode switching commands

- Instrument Setup mode:
  Instrument Setup screen:Instrument Setup commands
- TX/RX/Call-Processing mode
  Setup common parameter screen:Setup common parameter commands

TX/RX/Call-Processing command

- TX measurement screen switching commands

*** TX test screens ***		*** TX tester commands ***
Setup TX meas parameter screen	:	Setup TX meas parameter command
Modulation Analysis screen	:	Modulation Analysis command
Waveform Display screen	:	Waveform Display command
RF Power screen	:	RF Power command
Setup template screen	:	Setup template command
Occupied bandwidth screen	:	Occupied bandwidth command
Adjacent channel power screen	:	Adjacent channel power command
Power meter screen	:	Power meter command
Select TX all measure item screen	:	Select TX all measure item command
TX all measure screen	:	TX all measure command

- RX measurement screen switching commands

*** TX test screens ***		*** RX tester commands ***
Setup RX meas parameter screen	:	Setup RX meas parameter command
BER measure screen	:	BER measure command

- Call Processing commands

Call Processing test screens		***Call Processing tester commands***
Setup Call Processing Parameter screen	:	Setup Call Processing parameter command
Sequence Monitor screen	:	Sequence Monitor command

2.5.1 MT8802A common commands

MT8802A common commands are valid in all MT8802A modes.

(1) Save/Recall commands (parameter saving and calling)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Recall	Recall file	File No.	RCM n	---	---	
Save	Save file	File No.	SVM n	---	---	

(2) FD command (verify)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Verify	On	VERIFY ON	VERIFY?	ON	
		Off	VERIFY OFF	VERIFY?	OFF	

(3) Copy command (copy)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Copy		PRINT	---	---	
			PLS Ø	---	---	

(4) Single/Continuous switching command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Single	Measurement/	SNGLS	---	---	
		sweep start	S2	---	---	
		Measurement/	SWP	---	---	
		sweep synchronization	TS	---	---	
	Continuous		CONTS	---	---	
			S1	---	---	
	Measurement/	Measurement/sweep end	---	SWP?	SWP Ø	
	sweep status	During measurement/sweep	---	SWP?	SWP 1	

(5) Preset command (initialization, power-on setting)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Preset		PRE			
			INI			
			IP			
	Preset value	Setting at power failure	POWERON LAST	POWERON?	LAST	
		(Previous state)				
		Recall memory No.	POWERON n	POWERON?	n	

(6) Waveform memory read commands (XMA, XMAG, XMB, XMC, XMD, XME, XMM, XMN, XMP, XMS, XMV)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Modulation analysis	I-Q	Mem C	XMC p0,pl,b	XME? p0,pl,d	b,b,b,...	
		Origin offset	OXMC p0, b	OXMC? p0	b	
	Magnitude error	Mem N	XMN p,b	XMN? p,d	b,b,b,...	
	Phase error	Mem P	XMP p,b	XMP? p,d	b,b,b,...	
	Vector error	Mem V	XMV p,b	XMV? p,d	b,b,b,...	
RF power	RF power	Mem D	XMD p,b	XMD? p,d	b,b,b,...	
Occupied bandwidth	Occ.bw(Spectrum)	Mem B	XMB p,b	XMB? p,d	b,b,b,...	
	Occ.bw(High speed)	Mem E	XME p,b	XME? p,d	b,b,b,...	
Adjacent channel power	Adj.ch (Spectrum)	Mem B	XMB p,b	XMB? p,d	b,b,b,...	
	Adj.ch (High speed)	Mem S	XMS p,b	XMS? p,d	b,b,b,...	
	Adj.ch (Graph)	Mem AdjGraph	XMAG p,b	XMAG? p,d	b,b,b,...	
Demodulation	Demodulation	Mem M	XMM p,b	XMM? p,d	b,b,b,...	
Output format	Output format	ASCII	BIN Ø	---	---	
			BIN OFF	---	---	
		BINARY	BIN 1	---	---	
			BIN ON	---	---	

(7) Panel mode switching command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	TX/RX tester		PNLMD TESTER	PNLMD?	TESTER	
	Analog tester		PNLMD ANALOG	PNLMD?	ANALOG	
	Instrument setup		PNLMD SYSTEM	PNLMD?	SYSTEM	
	Spectrum Analyzer		PNLMD SPECT	PNLMD?	SPECT	

(8) Switch to upper screen command (BS)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Back screen		BS	---	---	

(9) Extended event status command (END)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Event status	END event status	Event status enable	ESE2 n	ESE2?	n	
		Event status register	---	ESR2?	n	
	ERR event status	Event status enable	ESE3 n	ESE3?	n	
		Event status register	---	ESR3?	n	

(10) Main common command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Serial No.		---	SERIAL?	n	
	Screen control	Off	SCREEN OFF	---	---	*RST for ON
	Ext. ref. input	Effective	---	EXTREF?	VALID	

2.5.2 Instrument Setup command

The Instrument Setup command is valid in Instrument Panel mode.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Hardware	Reference frequency	10MHz	REF 10MHZ	REF?	10MHZ	
		13MHz	REF 13MHZ	REF?	13MHZ	
	RF in/out	Main	RFINOUT MAIN	RFINOUT?	MAIN	
		AUX	RFINOUT AUX	RFINOUT?	AUX	
Display	Display	On	DSPL ON	---	---	
		Off	DSPL OFF	---	---	
	Title display	DATE/TIME	TTL DATE	TTL?	DATE	
		USER define	TTL USER	TTL?	USER	
		OFF	TTL OFF	TTL?	OFF	
	Title input	User title	TITLE a	TITLE?	a	
			KSE a	---	---	
	Select date display mode	Japan (yy/mm/dd)	DATEMODE YMD	DATEMODE?	YMD	
		USA (mm-dd-yy)	DATEMODE MDY	DATEMODE?	MDY	
		Europe (dd-mm-yy)	DATEMODE DMY	DATEMODE?	DMY	
	Set and read date	Japan (yy/mm/dd)	DATE yy,mm,dd	DATE?	yy,mm,dd	
	Set and read time		TIME hh,mm,ss	TIME?	hh,mm,ss	
Buzzer	Buzzer switch	On	ALARM ON	ALARM?	ON	
			BEP 1	---	---	
			BEP ON	---	---	
		Off	ALARM OFF	ALARM?	OFF	
			BEP Ø	---	---	
			BEP OFF	---	---	
	Sounds buzzer		BZR	---	---	
GPIB	Terminater	LF	TRM Ø	---	---	
		CR/LF	TRM 1	---	---	
RS232C	Baud rate	9600	BAUD 96ØØ	BAUD?	96ØØ	
		4800	BAUD 48ØØ	BAUD?	48ØØ	
		2400	BAUD 24ØØ	BAUD?	24ØØ	
		1200	BAUD 12ØØ	BAUD?	12ØØ	
	Parity	Even	PRTY EVEN	PRTY?	EVEN	
		Odd	PRTY ODD	PRTY?	ODD	
		Off	PRTY OFF	PRTY?	OFF	
	Date bit	7bits	DTAB 7	DTAB?	7	
		8bits	DTAB 8	DTAB?	8	
	Stop bit	1bit	STPB 1	STPB?	1	
		2bits	STPB 2	STPB?	2	
	Time out		TOUT t	TOUT?	t	
	Delimiter	LF	DELM Ø	---	---	
		CR/LF	DELM 1	---	---	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Print	Type	ESC/P (24DOT)	PMOD 6	PMOD?	6	
		HP	PMOD 3	PMOD?	3	
		BMP(B&W)	PMOD11	PMOD?	11	
color	Select pattern	Pattern1	COLORPTN COLOR1	COLORPTN?	COLOR1	
		Pattern2	COLORPTN COLOR2	COLORPTN?	COLOR2	
		Pattern3	COLORPTN COLOR3	COLORPTN?	COLOR3	
		Pattern4	COLORPTN COLOR4	COLORPTN?	COLOR4	
		User pattern	COLORPTN USERCOLOR	COLORPTN?	USERCOLOR	
	Copy from	Pattern1	COPYCOLOR COLOR1	---	---	
		Pattern2	COPYCOLOR COLOR2	---	---	
		Pattern3	COPYCOLOR COLOR3	---	---	
		Pattern4	COPYCOLOR COLOR4	---	---	
	User define	Red, green, blue	COLORDEF n,r,g,b,	COLORDEF? n	r,g,b	n:Frame number

2.5.3 TX/RX tester command

- The TX/RX tester commands are valid in TX/RX tester panel mode (on all RX/TX test screens).
- Query messages of the Setup common parameter command are also valid on the Setup common parameter screen and lower screens (all TX/RX test screens). (See paragraph 2.5.4.)

(1) System mode switching command (PDC, Call Processing)

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
PDC Call Processing		SYS PDC_CP	SYS?	PDC_CP	

(2) TX measurement screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup common parameter		MEAS SETCOM	MEAS?	SETCOM	
Setup TX meas parameter		MEAS SETTX	MEAS?	SETTX	
Select TX all measure item		MEAS TXITEM	MEAS?	TXITEM	
TX all measure		MEAS TXALL	MEAS?	TXALL	
Modulation analysis		MEAS MODANAL	MEAS?	MODANAL	
Waveform display		MEAS WAVEFORM	MEAS?	WAVEFORM	
RF power		MEAS RFPWR	MEAS?	RFPWR	
Setup template		MEAS SETTEMP	MEAS?	SETTEMP	
Occupied bandwidth	Spectrum	MEAS OBW,SPECT	MEAS?	OBW,SPECT	
	High speed	MEAS OBW,HIGH	MEAS?	OBW,HIGH	
Adjacent channel power	Spectrum(All)	MEAS ADJ,SPECT1	MEAS?	ADJ,SPECT1	
	Spectrum(Separate)	MEAS ADJ,SPECT2	MEAS?	ADJ,SPECT2	
	High speed	MEAS ADJ,HIGH	MEAS?	ADJ,HIGH	
Power meter		MEAS PWRMTR	MEAS?	PWRMTR	

(3) RX measurement screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup RX measure parameter		MEAS SETRX	MEAS?	SETRX	
Bit error rate		MEAS BER	MEAS?	BER	

(4) Call Proc. screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup Call Proc. parameter		MEAS SETCALL	MEAS?	SETCALL	
Sequence Monitor		MEAS SEQMON	MEAS?	SEQMON	

(5) Measur result status

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measur result status		---	MSTAT?	n	

• Response value n of MSTAT?

The table below lists the meanings of response value n of MSTAT? (measurement result status command).

Value of n	Explanation
0	Normal termination
1	RF input limit
2	Level over
3	Level under
4	Unmeasurable
5	Synchronous word undetectable
6	Synchronization being established (BER Measure)
7	Synchronization loss (BER Measure)
8	Overflow (BER Measure)
9	Unmeasured

(6) Trigger timeout command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Trigger timeout		TRGWAIT t	TRGWAIT?	t	

(7) Re-measurement mode command at shift screen

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Re-measurement mode		REMEAS ON	REMEAS?	ON	
		REMEAS OFF	REMEAS?	OFF	

(8) RF input/Output connector switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
RF in/out	Main	RFINOUT MAIN	RFINOUT?	MAIN	
	Aux	RFINOUT AUX	RFINOUT?	AUX	

(9) 10MHz/13MHz Reference Input inspection command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Reference Input		---	EXTREF?	a	a:VALID,INVALID

2.5.4 Setup common parameter command

- Program messages of the Setup common parameter command are valid on the Setup common parameter screen.
- Note that Level, Frequency, and Channel program messages are also valid on all measurement screens of the TX/RX test.
- Query messages of the Setup common parameter command are valid on the Setup common parameter and lower screens (all TX/RX test screens).

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
DUT control	DUT control		DUTCTRL CALLP	DUTCTRL?	CALLP	
			SIGNAL ON	SIGNAL?	ON	
			DUTCTRL NONE	DUTCTRL?	NONE	
			SIGNAL OFF	SIGNAL?	OFF	
Frequency traffic channel	Band	800MHz-1	FREQBAND 800MHZ_1	FREQBAND?	800MHZ_1	
			FREQBAND 800MHZ	FREQBAND?	800MHZ_1	
		800MHz-2	FREQBAND 800MHz_2	FREQBAND?	800MHZ_2	
		1500MHz	FREQBAND 1500MHz	FREQBAND?	1500MHZ	
	Channel		CHAN n	CHAN?	n	
	Band & Channel		TBANDCH 800MHZ_1,n	TBANDCH?	800MHZ_1,n	
			TBANDCH 800MHZ_2,n	TBANDCH?	800MHZ_2,n	
			TBANDCH 1500MHZ,n	TBANDCH?	1500MHZ,n	
	TX frequency		TFREQ f	TFREQ?	f	
	RX frequency		RFREQ f	RFREQ?	f	
Frequency control channel	Band	800MHz	CTRLBA 800MHz	CTRLBA?	800MHz	
		1500MHZ	CTRLBA 1500MHz	CTRLBA?	1500MHz	
	Channel		CTRLCH n	CTRLCH?	n	
Level	Reference level		RFLVL ℓ	RFLVL?	ℓ	
	Output level		OLVL ℓ	OLVL?	ℓ	
	MS power level		MSPWR n	MSPWR?	n	n: 0 3.0W 7 3.0W-4dB /2.0W 6 3.0W-8dB/ 2.0W-4dB 5 3.0W-12dB/ 2.0W-8dB 4 3.0W-16dB/ 2.0W-12dB 3 3.0W-20dB/ 2.0W-16dB 2 3.0W-24dB/ 2.0W-20dB 1 3.0W-28dB/ 2.0W-24dB

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Signal	Measuring Object	MS-TCH	MEASOBJ MSTCH	MEASOBJ?	MSTCH	
			MEASOBJ MSCOM	---	---	
		Continuous	MEASOBJ CONT	MEASOBJ?	CONT	
	Channel per carrier	Full rate	CHCARR FULL	CHCARR?	FULL	
		Half rate	CHCARR HALF	CHCARR?	HALF	
	Slot number		SLTNUM n	SLTNUM?	n	
	Sync word pattern	S1	PATT S1	PATT?	S1	
		S2	PATT S2	PATT?	S2	
		S3	PATT S3	PATT?	S3	
		S4	PATT S4	PATT?	S4	
		S5	PATT S5	PATT?	S5	
		S6	PATT S6	PATT?	S6	
	Color code		CC h	CC?	h	
	Scramble	On	SCBL ON	SCBL?	ON	
		Off	SCBL OFF	SCBL?	OFF	
	Scramble code		SCBLC h	SCBLC?	h	
	TCH pattern	PN9	TCH PN9	TCH?	PN9	
		PN15	TCH PN15	TCH?	PN15	
		Echo back	TCH ECHO	TCH?	ECHO	
	Pattern(Continuous)	PN9	PAT PN9	PAT?	PN9	
		PN15	PAT PN15	PAT?	PN15	
		bit	PAT bit	PAT?	bit	bit:0000 to 1111
	Time alignment	Currently	TMALIGN CURRENTLY	TMALIGN?	CURRENTLY	
		1Symbol	TMALIGN 1SYMBOL	TMALIGN?	1SYMBOL	
		2Symbol	TMALIGN 2SYMBOL	TMALIGN?	2SYMBOL	
		3Symbol	TMALIGN 3SYMBOL	TMALIGN?	3SYMBOL	
		4Symbol	TMALIGN 4SYMBOL	TMALIGN?	4SYMBOL	
		5Symbol	TMALIGN 5SYMBOL	TMALIGN?	5SYMBOL	
		6Symbol	TMALIGN 6SYMBOL	TMALIGN?	6SYMBOL	
		Reference	TMALIGN REFERENCE	TMALIGN?	REFERENCE	

2.5.5 Call processing commands

(1) Sequence Monitor screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Call processing status	Start test		CALLSA			
	Stop test		CALLSO			
	Termination		CALLPG			
	Disc from NW		CALLDISC			
	Refresh status		CALLRFR			
Scenario Load	File No.		SLOAD n	SLOAD?	n	
	Default		SLOAD DEFAULT	SLOAD?	DEFAULT	
Call Processing result	C/P status			CALLSTAT?	ss	
	C/P error			CALLERR?	ss,ec	
	C/P result			CALLRSLT? ss	flg,ec	
MS parameter	MSI			CALLMSID?	flg,h	
	MS phone No.			CALLMSNO?	flg,n	
	NW phone No.			CALLNWNO?	flg,n	
	RCH			CALLURCH?	flg,nM,nR,nE	
	Time alignment			CALLTMAL?	flg, ℓ	
	Input level			CALLILVL?	flg, ℓ	
	Current channel			CALLCH?	flg,n1,n2,n3	n1:Band n2:Channel n3:Slot
Measurement Result (Multi-response)			--- . . . . . . ---	SEQMONMEAS? . . . . . . SEQMONMEAS? n0,n1,n2,n3,n4, n5,n6,n7,n8	r0,r11,r12,fl2,r2,fl3,r3, fl4,r4,fl5,r51,r52,r53,fl6, r6,fl7,r7,fl8,r81,r82,r83 . . . . . . r0,r11,r12,fl2,r2,fl3,r3, fl4,r4,fl5,r51,r52,r53,fl6, r6,fl7,r7,fl8,r81,r82,r83	Respond to all measurements See *1 . . . . . . Respond to selected measurements See *1

*1

Query Format:

SEQMONMEAS? n0,n1,n2,n3,n4,n5,n6,n7,n8

n0 to 8: display the returned values

1=Return measurement

0=Not return measurement

Query Number of Query parameters: 9.

Query Example:

SEQMONMEAS? 0,0,0,1,1,0,0,0,0

The query returns MS Phone Number, NW Phone Number measurement values.

Response Format:
r0 ,r11,r12,fl2,r2, fl3,r3 fl4,r4, fl5,r51,r52,t53,fl6,r6,fl7,r7,fl8,r81,r82,r83

r0:Call Status
r1:Error Status
r11,r12 r11:Sequence No. of Error ,r12:Error Code
r2:MSID
fl2,r2 fl2:Not Received yet/Reception Complete,r2:MSID

r3:MS Phone No.
fl3,r3 fl3:Not Received yet/Reception Complete,r3:MS Phone No.
r4:NW Phone No.
fl4,r4 fl4:Not Received yet/Reception Complete,r4:NW Phone No.
r5:RCH
fl5,r51,r52,r53 fl5:Not Received yet/Reception Complete,r51:MS Power Level, r52:RSSI,r53:ERR
r6:Time Alignment
fl6,r6 fl6:Not Received yet/Reception Complete,r6:Time Alignment
r7:Input Level
fl7,r7 fl7:Not Received yet/Reception Complete,r7:Input Level
r8:Current Channel
fl8,r81,r82,r83 fl8:Not Received yet/Reception Complete,r81:Band,r82:Channel,r83:Slot

ResponseExample: (MS Phone Number,MW Phone No.)
1,8226680,1,123

Meaning of Response data

ss(Sequence)	0:Stop, 1:Idle, 2:Registration, 3:Origination, 4:Termination, 5:Communication, 6:Hand Over, 7:Disc from NW, 8:Disc from MS
flg(Received flag)	0:Not received, 1:Received(When Received flag is 0 then other data are set to 0.)
ec(Error code)	0:No error, 1 to 255:Error code
nM(MS power level)	0 to 7
nR(RSSI)	0 to 31
nE(ERR)	0 to 3
n1(Band)	0:800MHz-1, 1:800MHz-2, 2:1.5GHz

(2) Setup Call Processing Parameter screen command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Network ID	Country number		CNTRY n	CNTRY?	n	
	Operater Group number		OPEGRP n	OPEGRP?	n	
	Network identity in Group		NWIDENT n	NWIDENT?	n	
	CCH Color code		CTRLCC h	CTRLCC?	h	
	Location ID		LOCID n	LOCID?	n	
Paging MSI	Paging MSI		PGMSI AUTO,h PGMSI FIX,h	PGMSI?	AUTO,h FIX,h	

2.5.6 TX tester commands

- Program messages of the TX tester commands are valid in ranges defined on TX test screens.
- Query messages of the TX tester command are valid on all TX test screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all TX test measurement screens. (See paragraph 2.5.4.)

(1) Setup TX meas parameter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement trigger	Sync word	SW	MEASTRG SW	MEASTRG?	SW	
		Video	MEASTRG VIDEO	MEASTRG?	VIDEO	
TX Calibration	User cal factor		UCAL ℓ	UCAL?	ℓ	
	User cal factor Band1		TXUCALBA1 ℓ	TXUCALBA1?	ℓ	
	User cal factor Band2		TXUCALBA2 ℓ	TXUCALBA2?	ℓ	
RCR-STD27	RCR-STD27	RCR-STD27B	STD27 B	STD27?	B	
		RCR-STD27C	STD27 C	STD27?	C	

(2) Modulation Analysis command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Bit rate measure	On	BRMEAS ON	BRMEAS?	ON	
		Off	BRMEAS OFF	BRMEAS?	OFF	
	10 bursts average	On	BSTAVG ON	BSTAVG?	ON	
		Off	BSTAVG OFF	BSTAVG?	OFF	
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	1	
			CALVAL ℓ	CALVAL?	f, ℓ	f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : –10.00 to 10.00
	Calibration cancel		CALCANCEL	---	---	
Strage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
Measure result	Carrier frequency		---	CARRF?	f	
	Carrier frequency error		---	CARRFERR?	f	
			---	CARRFERR? un	u	un:HZ,PPM
	RMS vector error		---	VECTERR?	u	
	First 10 symbols RMS vector error		---	FVECTERR?	u	
	Peak vector error		---	PVECTERR?	u	
	Magnitude error		---	MAGTDERR?	u	
	Phase error		---	PHASEERR?	u	
	Origin offset		---	ORGNOFS?	u	
	Droop factor		---	DRPFACT?	u	
	Bit rate		---	BITR?	u	
	Bit rate error		---	BITRERR?	u	
Measure result (Remote control Only)	Peak vector error symbol		---	PVECTSYM?	s	
	+Peak magnitude error		---	PMAGTDERR? +	u	
	+Peak magnitude error symbol		---	PMAGTDSYM? +	s	
	–Peak magnitude error		---	PMAGTDERR? –	u	
	–Peak magnitude error symbol		---	PMAGTDSYM? –	s	
	+Peak phase error		---	PPHASEERR? +	u	
	+Peak phase error symbol		---	PPHASESYM? +	s	
	–Peak phase error		---	PPHASEERR? –	u	
	–Peak phase error symbol		---	PPHASESYM? –	s	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement Result (Multi-response)			---	MODANALMEAS?	r0,r1,r2,r3,r4,r5,r6, r7,r8,r9,fl10,r10,fl11, r11,r12,r13,r14,r15, r16,r17,r18,r19,r20	Respond to all measurements See *1
			---	MODANALMEAS? n0,n1,n2,n3,n4,n5, n6,n7,n8,n9,n10,n11, n12,n13,n14,n15,n16, n17,n18,n19,n20	r0,r1,r2,r3,r4,r5,r6, r7,r8,r9,fl10,r10,fl11 ,r11,r12,r13,r14,r15 ,r16,r17,r18,r19,r20	Respond to selected measurements See *1

*1

Query Format:

MODANALMEAS? n0,n1,n2,n3,n4,n5,n6,n7,n8,n9,n10,n11,n12,n13,n14,n15,n16,n17,n18,n19,n20

n0 to 20: display the returned values

1=Return measurements

0=Not return measurements

Number of Query parameters: 21

Query Example:

MODANALMEAS? 0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

The query returns Carrier freq. error (ppm), RMS Vector Error measurement values.

Response Format:

r0,r1,r2,r3,r4,r5,r6,r7,r8,r9,fl10,r10,fl11,r11,r12,r13,r14,r15,r16,r17,r18,r19,r20

ri: Result data

fln: 0: Normal end, 4: Abnormal end, 9: Measurement OFF

r0:Carrier Freq r1:Carrier Freq Error(Hz) r2:Carrier Freq Error(ppm)
r3:RMS Vector Error r4:First 10 Symbols RMS Vector Error
r5:Peak Vector Error r6:Magunitude error r7:Phase Error
r8:Origin Offset r9:Droop Factor r10:Bit Error
r11:Bit Rate Error r12:Peak Vector Error Symbol r13:+Peak Magnitude Error
r14:+Peak Mag Error Symbol r15:-Peak Magnitude Error
r16:-Peak Mag Error Symbol r17:+Peak Phase Error
r18:+Peak Phase Error Symbol r19:-Peak Phase Error
r20:-Peak Phase Error Symbol

Response Example: (Carrier freq error(ppm),RMS Vector Error)

0.1,2.82

(3) Waveform Display command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Trace format	Trace format	Constellation	TRFORM CONSTEL	TRFORM?	CONSTEL	
			TRFORM IQ	---	---	
		Eye diagram	TRFORM EYE	TRFORM?	EYE	
		Vector error	TRFORM VECT	TRFORM?	VECT	
		Phase error	TRFORM PHASE	TRFORM?	PHASE	
		Magnitude error	TRFORM MAGTD	TRFORM?	MAGTD	
Scale mode	Interpolation	Non	INTPOL NON	INTPOL?	NON	
	(Constellation)	Linear	INTPOL LIN	INTPOL?	LIN	
		10points	INTPOL POINT1Ø	INTPOL?	POINT1Ø	
	Error scale	5%	ERRSC 5	ERRSC?	5	
	(Constellation)	10%	ERRSC 1Ø	ERRSC?	1Ø	
		20%	ERRSC 2Ø	ERRSC?	2Ø	
		OFF	ERRSC OFF	ERRSC?	OFF	
	Error scale offset	0°	SCOFS Ø	SCOFS?	Ø	
	(Constellation,Eye)	22.5°	SCOFS 22.5	SCOFS?	22.5	
	Vertical scale	5 [deg,%]	VSCALE 5	VSCALE?	5	
	(Vector,Phase,Magnitude)	10 [deg,%]	VSCALE 1Ø	VSCALE?	1Ø	
		20 [deg,%]	VSCALE 2Ø	VSCALE?	2Ø	
		50 [deg,%]	VSCALE 5Ø	VSCALE?	5Ø	
		100 [deg,%]	VSCALE 1ØØ	VSCALE?	1ØØ	
Strage mode	Strage mode	Normal	STORAGE NRM	STORAGE?	NRM	
		Over write	STORAGE OVER	STORAGE?	OVER	
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	1	
			CALVAL ℓ	CALVAL?	f, ℓ	f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : −10.00 to 10.00
	Calibration cancel		CALCANCEL	---	---	
Marker	Marker mode	Normal	MKR NRM	MKR?	NRM	
		Off	MKR OFF	MKR?	OFF	
	Marker position (Symbol)	Symbol	MKRS r	MKRS?	r	
			MKN r	MKN?	r	
	Marker level		---	MKL?	r	
		I	---	MKL? I	r	
		Q	---	MKL? Q	r	
Measure result	Refer to Modulation analysis					

(4) RF Power command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Window		Slot	WINDOW SLOT	WINDOW?	SLOT	
		Frame	WINDOW FRAME	WINDOW?	FRAME	
		Leading	WINDOW LEAD	WINDOW?	LEAD	
			WINDOW RISE	---	---	
		Trailing	WINDOW TRAIL	WINDOW?	TRAIL	
			WINDOW FALL	---	---	
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	1	
			CALVAL ℓ	CALVAL?	f, ℓ	f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : –10.00 to 10.00
	Calibration cancel		CALCANCEL	---	---	
Marker	Merker mode	Normal	MKR NRM	MKR?	NRM	
		Off	MKR OFF	MKR?	OFF	
	Marker position	Symbol	MKRS r	MKRS?	r	
			MKN r	MKN?	r	
	Marker level		---	MKL?	ℓ	
Level	Unit	dBm	UNIT DBM	UNIT?	DBM	
		nW/uW/mW/W	UNIT WATT	UNIT?	WATT	
	Level	Relative	LVLREL ON	LVLREL?	ON	
			MTEMPREL ON	MTEMPREL?	ON	
		Absolute	LVLREL OFF	LVLREL?	OFF	
			MTEMPREL OFF	MTEMPREL?	OFF	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Max hold		STORAGE MAX	STORAGE?	MAX	
	Min hold		STORAGE MIN	STORAGE?	MIN	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Cumulative		STORAGE CUM	STORAGE?	CUM	
	Over write		STORAGE OVER	STORAGE?	OVER	
	Wide dynamic range		STORAGE WIDE	STORAGE?	WIDE	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
Recall template		File No.	SLCTTEMP n	SLCTTEMP?	n	n:0~99
			RCLTEMP n	---	---	n:0~99
Select template		Standard	SLCTTEMP STD	SLCTTEMP?	STD	
		Off	SLCTTEMP OFF	SLCTTEMP?	OFF	
		Not selected	---	SLCTTEMP?	NOT	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure result	TX power		---	TXPWR?	ℓ	
			---	TXPWR? un	ℓ	un:DBM,WATT
	Carrirer off power		---	OFFPWR?	ℓ	
			---	OFFPWR?	ℓ	un:DBM,WATT
	On/Off ratio		---	RATIO?	ℓ	
	Burst Timing		---	BSTTIMING?	r	
	Template PASS/FAIL (On section)	PASS	---	TEMPPASS? ON	PASS	
		FAIL	---	TEMPPASS? ON	FAIL	
	Template PASS/FAIL (Off section)	PASS	---	TEMPPASS? OFF	PASS	
		FAIL	---	TEMPPASS? OFF	FAIL	
	Rising time		---	RISETM?	r	
	Falling time		---	FALLTM?	r	
(Remote control Only)	Frame mean power		---	FMEANPWR?	ℓ	
			---	FMEANPWR? un	ℓ	un:DBM,WATT
	Slot mean power		---	SMEANPWR?	ℓ	
			---	SMEANPWR? un	ℓ	un:DBM,WATT
	Slot power		---	SLOTPWR? n	ℓ	dBm **
	Reference power for template		---	TEMPRPWR?	ℓ	dB **
Measurement Result (Multi-response)			---	RFPWRMEAS?	r0,r1,r2,r3,r4,r5,r6, r7,r8,r9,r10,r11,r12, r13,r14,r15,r16,r17, r18,r19,r20	Respond to all measurements See *1
			---	RFPWRMEAS? n0,n1,n2,n3,n4,n5, n6,n7,n8,n9,n10, n11,n12,n13,n14, n15,n16,n17,n18, n19,n20	r0,r1,r2,r3,r4,r5,r6, r7,r8,r9,r10,r11,r12, r13,r14,r15,r16,r17, r18,r19,r20	Respond to selected measurements See *1

*1

Query Format: RFPWRMEAS? n0,n1,n2,n3,n4,n5,n6,n7,n8,n9,n10,n11,n12,n13,n14,n15,n16,n17,n18,n19,n20

n to n20: Display returned values

1: Return measurements

0: Not return measurements

Number of Query parameters: 21.

Query Example:

RFPWRMEAS? 0,0,1,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

The query returns Carrier Off Power(dBm), Burst Timing measurement values.

Response Format:

r0,r1,r2,r3,r4,r5,r6,r7,r8,r9,r10,r11,r12,r13,r14,r15,r16,r17,r18,r19,r20

ri:Result data

r0:TX Power(dBm) r1:TX Power(Watt) r2:Carrier Off Power(dBm)

r3:Carrier Off Power(Watt) r4:On/Off Ratio r5:Burst Timing

r6:Template Pass/Fail(On) r7:Template Pass/Fail(Off)

r8:Rising Time r9:Falling Time r10:Frame Mean Power(dBm)

r11:Frame Mean Power(Watt) r12:Slot Mean Power(dBm)

r13:Slot Mean Power(Watt) r14:Slot Power 1(dBm) r15:Slot Power 2(dBm)

r16:Slot Power 3(dBm) r17:Slot Power 4(dBm) r18:Slot Power 5(dBm)

r19:Slot Power 6(dBm) r20:Reference Power for Template(dB)

Response Example: (Carrier Off Power(dBm),Burst Timing)

-39.48,0.010

(5) Setup template command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Save template		File No.	SAVETEMP n	---	---	n:0 to 99
Off level		dBm	OFFLVL DBM	OFFLVL?	DBM	
		dB	OFFLVL DB	OFFLVL?	DB	
Level modify		Limit-1	TEMPLVL 1, ℓ	TEMPLVL? 1	ℓ	
		Limit-2	TEMPLVL 2, ℓ	TEMPLVL? 2	ℓ	
		Limit-3	TEMPLVL 3, ℓ	TEMPLVL? 3	ℓ	
		Limit-4	TEMPLVL 4, ℓ	TEMPLVL? 4	ℓ	
		Limit-5	TEMPLVL 5, ℓ	TEMPLVL? 5	ℓ	

(6) Occupied bandwidth command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	1	
			CALVAL ℓ	CALVAL?	f, ℓ	f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : –10.00 to 10.00
	Calibration cancel		CALCANCEL	---	---	
Measure method	Method	Spectrum	MEAS OBW,SPECT	MEAS?	OBW,SPECT	
			MEAS OBW,STD	---	---	
		High speed	MEAS OBW,HIGH	MEAS?	OBW,HIGH	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
Measure result	Occupied Bandwidth		---	OCCBW?	f	
			---	OBW?	f	
	Center Frequency		---	OBWFREQ?	f	
				CENTER		
	Lower		---	OBWFREQ?	f	
				LOWER		
			---	OBWFREQ? –	f	
	Upper		---	OBWFREQ?	f	
				UPPER		
			---	OBWFREQ? +	f	
	Span width		---	FSPAN?	f	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement Result (Multi-response)			----	OBWMEAS?	r0,r1,r2,r3,r4	Respond to all measurements See *1
			----	OBWMEAS? n0,n1,n2,n3,n4	r0,r1,r2,r3,r4	Respond to selected measurements See *1

*1

Query Format:

OBWMEAS? n0,n1,n2,n3,n4

n0 to n4: Display returned values

1=Return measurements

0=Not return measurements

Number of Query parameters: 5.

Query Example:

OBWMEAS? 0,1,0,1,0

The query returns Center Frequency, Upper measurement values.

Response Format:

r0,r1,r2,r3,r4,r5

ri:Result data

r0:Occupied Bandwidth

r1:Center Frequency

r2:Lower

r3:Upper

r3:Upper

r4:Span Width

Response Example: (Center Frequency, Upper)

1429024877.93,13085.94

(7) Adjacent channel power command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	1	
			CALVAL ℓ	CALVAL?	f, ℓ	f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : –10.00 to 10.00
			MEAS ADJ,STD1	---	---	
		Spectrum	MEAS ADJ,SPECT2	MEAS?	ADJ,SPECT2	
		(Separate)	MEAS ADJ,STD2	---	---	
		High speed	MEAS ADJ,HIGH	MEAS?	ADJ,HIGH	
Level	Unit	dBm	UNIT DBM	UNIT?	DBM	
		mW	UNIT MW	UNIT?	MW	
		uW	UNIT UW	UNIT?	UW	
		nW	UNIT NW	UNIT?	NW	
		dB	UNIT DB	UNIT?	DB	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average count		AVR n	AVR?	n	
			VAVG n	VAVG?	n	
Marker	Marker	Meas on	ADJMEAS ON	ADJMEAS?	ON	
		Meas off	ADJMEAS OFF	ADJMEAS?	OFF	
	Marker position	Point	MKP p	MKP?	p	p:Screen
		Frequency	MKRS f	MKRS?	f	coordinate
			MKN f	MKN?	f	
	Marker level		---	MKL?	ℓ	
Measure result	Adjacent channel power	Lower-2~ Upper-2	---	ADJCH? ps	ℓ	ps:LOW2, LOW1,UP1,UP2
			---	ADJCH? ps,un	ℓ	un:DBM,WATT,DB,
	Span width		---	FSPAN?	f	
	Signal power		---	SPWR?	ℓ	
Measurement Result (Multi-response)			---	ACPMEAS?	ru0,rl0,ru1,rl1,r2,r3	Respond to all measurements See *1
			---	ACPMEAS? n0,n1,n2,n3	ru0,rl0,ru1,rl1,r2,r3	Respond to selected measurements See *1

*1

Query Format Example:

ACPMEAS? n0,n1,n2,n3

n0 to n3: Display returned values

1=Return measurements

0=Not return measurements

Number of Query parameters: 4

Query Example:

ACPMEAS? 0,0,1,1

The query returns Span Width, Signal Power measurement values.

Response Format:

ru0,rl0,ru1,rl1,r2,r3

rui,rli,rn:Result data

Note: Unit settings shown on the display are used.

ru0: Upper Level(50kHz)

rl0: Lower Level(50kHz)

ru1: Upper Level(100kHz)

rl1: Lower Level(100kHz)

r2: Span Width

r3: Signal Power

Response Example: (Span Wigth,Signal Power)

244140,11.95

(8) Power meter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Calibration	Zero set		ZEROSET	---	---	
			ZAJ	---	---	
Range	Range up		RNG UP	---	---	
	Range down		RNG DN	---	---	
	Adjust range		ADJRNG	---	---	
	Hold (0.1mW)		RNG2	---	---	
	Hold (1mW)		RNG3	---	---	
	Hold (10mW)		RNG4	---	---	
	Hold (100mW)		RNG5	---	---	
Measure result	Power		---	POWER? un	ℓ	un:DBM,WATT,DB

(9) Select TX all measure item command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	10 bursts average	On	MBSTAVG ON	MBSTAVG?	ON	
		Off	MBSTAVG OFF	MBSTAVG?	OFF	
Frequency	Frequency	On	MCARRF ON	MCARRF?	ON	
		Off	MCARRF OFF	MCARRF?	OFF	
	Frequency error	Off	MCARRFERR OFF	MCARRFERR OFF	OFF	
	Frequency error Unit	kHz	UCARRFERR KHZ	UCARRFERR?	KHZ	
		ppm	UCARRFERR PPM	UCARRFERR?	PPM	
	Frequency error Judge	On	JCARRFERR ON	JCARRFERR?	ON	
		Off	JCARRFERR OFF	JCARRFERR?	OFF	
	Frequency error Limit	Upper limit	ULCARRFERR f	ULCARRFERR?	f	
				ULCARRFERR? un	f	un:KHZ,PPM
Modulation analysis	RMS vector error Measurement	On	MVECTERR ON	MVECTERR?	ON	
		Off	MVECTERR OFF	MVECTERR?	OFF	
	RMS vector error Judge	On	JVECTERR ON	JVECTERR?	ON	
		Off	JVECTERR OFF	JVECTERR?	OFF	
	RMS vector error Limit	Upper Limit	ULVECTERR r	ULVECTERR?	r	
	10 bursts average	On	MBSTAVG ON	MBSTAVG?	ON	
		Off	MBSTAVG OFF	MBSTAVG?	OFF	
	Peak vector error Measurement	On	MPVECTERR ON	MPVECTERR?	ON	
		Off	MPVECTERR OFF	MPVECTERR?	OFF	
	Peak vector error Judge	On	JPVECTERR ON	JPVECTERR?	ON	
		Off	JPVECTERR OFF	JPVECTERR?	OFF	
	Peak vector error Limit	Upper limit	ULPVECTERR r	ULPVECTERR?	r	
	Magnitude error Measurement	On	MMAGTDERR ON	MMAGTDERR?	ON	
		Off	MMAGTDERR OFF	MMAGTDERR?	OFF	
	Magnitude error Judge	On	JMAGTDERR ON	JMAGTDERR?	ON	
		Off	JMAGTDERR OFF	JMAGTDERR?	OFF	
	Magnitude error Limit	Upper Limit	ULMAGTDERR r	ULMAGTDERR?	r	
	Phase error Measurement	On	MPHASEERR ON	MPHASEERR?	ON	
		Off	MPHASEERR OFF	MPHASEERR?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Modulation analysis	Phase error Judge	On	JPHASEERR ON	JPHASEERR?	ON	
		Off	JPHASEERR OFF	JPHASEERR?	OFF	
	Phase error Limit	Upper Limit	ULPHASEERR r	ULPHASEERR?	r	
	Origin offset Measurement	On	MORGNOFS ON	MORGNOFS?	ON	
		Off	MORGNOFS OFF	MORGNOFS?	OFF	
	Origin offset Judge	On	JORGNOFS ON	JORGNOFS?	ON	
		Off	JORGNOFS OFF	JORGNOFS?	OFF	
	Origin offset Limit	Upper Limit	ULORGNOFS f	ULORGNOFS?	r	
	Bit rate error Measurement	On	MBITRERR ON	MBITRERR?	ON	
		Off	MBITRERR OFF	MBITRERR?	OFF	
	Bit rate error Judge	On	JBITRERR ON	JBITRERR?	ON	
		Off	JBITRERR OFF	JBITRERR?	OFF	
	Bit rate error Limit	Upper Limit	ULBITRERR r	ULBITRERR?	r	
RF power	TX power Measurement	On	MTXPWR ON	MTXPWR?	ON	
		Off	MTXPWR OFF	MTXPWR?	OFF	
	TX power Unit	dBm	UTXPWR DBM	UTXPWR?	DBM	
		W	UTXPWR WATT	UTXPWR?	WATT	
	TX power Judge	On	JTXPWR ON	JTXPWR?	ON	
		Off	JTXPWR OFF	JTXPWR?	OFF	
	TX power Limit	Lower limit	LLTXPWR ℓ	LLTXPWR?	ℓ	
				LLTXPWR? un	ℓ	
		Upper limit	ULTXPWR ℓ	ULTXPWR?	ℓ	
				ULTXPWR? un	ℓ	un:DBM,WATT
	Carrier off power Measurement	On	MOFFPWR ON	MOFFPWR?	ON	
		Off	MOFFPWR OFF	MORRPWR?	OFF	
	Carrier off power Unit	dBm	UOFFPWR DBM	UOFFPWR?	DBM	
		W	UOFFPWR WATT	UOFFPWR?	WATT	
	Carrier off power Judge	On	JOFFPWR ON	JOFFPWR?	ON	
		Off	JOFFPWR OFF	JOFFPWR?	OFF	
	Carrier off power Limit	Upper limit	ULOFFPWR ℓ	ULOFFPWR?	ℓ	
				ULOFFPWR? un	ℓ	un:DBM,WATT
	On/Off ratio Measurement	On	MRATIO ON	MRATIO?	ON	
		Off	MRATIO OFF	MRATIO?	OFF	
	On/Off ratio Judge	On	JRATIO ON	JRATIO?	ON	
		Off	JRATIO OFF	JRATIO?	OFF	
	On/Off ratio Limit	Lower limit	LLRATIO ℓ	LLRATIO?	ℓ	
	Burst Timing Measurement	On	MBSTTIMING ON	MBSTTIMING?	ON	
		Off	MBSTTIMING OFF	MBSTTIMING?	OFF	
	Burst Timing Judge	On	JBSTTIMING ON	JBSTTIMING?	ON	
		Off	JBSTTIMING OFF	JBSTTIMING?	OFF	
	Burst Timing Limit	Upper limit	ULBSTTIMING f	ULBSTTIMING?	f	
		Lower limit	LLBSTTIMING f	LLBSTTIMING?	f	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
RF power	Rising time Measurement	On	MRISETM ON	MRISETM?	ON	
		Off	MRISETM OFF	MRISETM?	OFF	
	Rising time Judge	On	JRISETM ON	JRISETM?	ON	
		Off	JRISETM OFF	JRISETM?	OFF	
	Rising time Limit	Lower limit	LLRISETM r	LLRISETM?	r	
		On	MFALLTM ON	MFALLTM?	ON	
		Off	MFALLTM OFF	MFALLTM?	OFF	
	Falling time Judge	On	JFALLTM ON	JFALLTM?	ON	
		Off	JFALLTM OFF	JFALLTM?	OFF	
	Falling time Limit	Lower limit	LLFALLTM r	LLFALLTM?	r	
		Upper limit	ULFALLTM r	ULFALLTM?	r	
	Template Pass/Fail	On	MTEMPPASS ON	MTEMPPASS?	ON	
		Off	MTEMPPASS OFF	MTEMPPASS?	OFF	
	Template Pass/Fail zone	On Only	LTEMPPASS ON	LTEMPPASS?	ON	
		On & Off	LTEMPPASS BOTH	LTEMPPASS?	BOTH	
Occupied bandwidth	Method	Spectrum	AMEAS OBW,SPECT	AMEAS? OBW	SPECT	
		High speed	AMEAS OBW,HIGH	AMEAS? OBW	HIGH	
	Occupied Bandwidth Measurement	On	MOCCBW ON	MOCCBW?	ON	
		Off	MOCCBW OFF	MOCCBW?	OFF	
	Occupied Bandwidth Judge	On	JOCCBW ON	JOCCBW?	ON	
		Off	JOCCBW OFF	JOCCBW?	OFF	
	Occupied Bandwidth Limit	Upper limit	ULOCCBW f	ULOCCBW?	f	
	Lower Measurement	On	MOBWFREQ LOW,ON	MOBWFREQ? LOW	ON	
		Off	MOBWFREQ LOW,OFF	MOBWFREQ? LOW	OFF	
	Lower Judge	On	JOBWFREQ LOW,ON	JOBWFREQ? LOW	ON	
		Off	JOBWFREQ LOW,OFF	JOBWFREQ? LOW	OFF	
	Lower Limit	Lower limit	LLOBWREQ LOW,f	LLOBWREQ? LOW	f	
	Upper Measurement	On	MOBWREQ UP,ON	MOBWREQ? UP	ON	
		Off	MOBWREQ UP,OFF	MOBWREQ? UP	OFF	
	Upper Judge	On	JOBWREQ UP,ON	JOBWREQ? UP	ON	
		Off	JOBWREQ UP,OFF	JOBWREQ? UP	OFF	
	Upper Limit	Upper limit	ULOBWREQ UP,f	ULOBWREQ? UP	f	
Adjacent channel power	Method	Spectrum(All)	AMEAS ADJ,SPECT1	AMEAS? ADJ	SPECT1	
		Spectrum (Separate)	AMEAS ADJ,SPECT2	AMEAS? ADJ	SPECT2	
		High speed	AMEAS ADJ,HIGH	AMEAS? ADJ	HIGH	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Adjacent channel power	Lower-2~Upper-2 Measurement	On	MADJCH po,ON	MADJCH? po	ON	po:LOW2, LOW1,UP1,UP2
		Off	MADJCH po,OFF	MADJCH? po	OFF	
	Lower-2~Upper-2 Unit	dBm	UADJCH po,DBM	UADJCH? po	DBM	po:LOW2, LOW1,UP1,UP2
		dB	UADJCH po,DB	UADJCH? po	DB	
		mW	UADJCH po,MW	UADJCH? po	MW	
		uW	UADJCH po,UW	UADJCH? po	UW	
		nW	UADJCH po,NW	UADJCH? po	NW	
	Lower-2~Upper-2 Judge	On	JADJCH po,ON	JADJCH? po	ON	po:LOW2, LOW1,UP1,UP2
		Off	JADJCH po,OFF	JADJCH? po	OFF	
	Lower-2~Upper-2 Limit	Upper limit	ULADJCH po, ℓ	ULADJCH? po	ℓ	po:LOW2, LOW1,UP1,UP2
				ULADJCH? po un	ℓ	un:DBM, DB,WATT
Standard set up	Standard		AITEM STD	---	---	

(10) TX all measure command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Calibration	Adjust range		ADJRNG	---	---	
	Calibration		PWRCAL	PWRCAL?	1	
			CALVAL ℓ	CALVAL?	f, ℓ	f=0: Not calibrated f=1: Internal calibration f=2: External calibration ℓ : -10.00 to 10.00
	Calibration cancel		CALCANCEL	---	---	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Wide dynamic range		STORAGE WIDE	STORAGE?	WIDE	
	Average On		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average Off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
Measure judgement	Carrier frequency error		---	JCARRFERR?	b	b:PASS,FAIL
	RMS vector error		---	JVECTERR?	b	
	Peak vector error		---	JPVECTERR?	b	
	Magnitude error		---	JMAGTDERR?	b	
	Phase error		---	JPHASEERR?	b	
	Origin offset		---	JORGNOFS?	b	
	Bit rate error		---	JBITRERR?	b	
	TX power		---	JTXPWR?	b	
	Carrier off power		---	JOFFPWR?	b	
	On/Off ratio		---	JRATIO?	b	
	Burst timing		---	JBSTTIMING?	b	
	Rising time		---	JRISETM?	b	
	Falling time		---	JFALLTM?	b	
	Template		---	TEMPPASS?	b	
	Occupied bandwidth		---	JOCCBW?	b	
	Lower		---	JOBWFREQ? L	b	
	Upper		---	JOBWFREQ? U	b	
	Adjacent channel power	Lower2~Upper2	---	JADJCH? ps	b	po:LOW2, LOW1,UP1,UP2
Total judgement	Total judgement	PASS	---	JTOTAL?	PASS	
		FAIL	---	JTOTAL?	FAIL	
Measurement result	All Measurement		---	ALL MEAS? a	n,r...	a:MODANL, RFPWR, OBW, ADJ
	See each Measure screen for result.					

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement Result (Multi-response)	Modulation analysis & RF Power		---	ALLMEAS? MODRF	PFn0,r0,PFn1,r1,PFn2,r2 PFn3,r3,PFn4,r4,PFn5,r5, PFn6,r6,PFn7,r7,PFn8,r8, PFn9,r9,PFn10,r10, PFn11,r11,PFn12,r12, PFn13,r13,PFn14,r14,	Respond to all measurements See *1
			---	ALLMEAS? MODRF, n0,n1,n2,n3,n4,n5,n6,n7, n8,n9,n10,n11,n12,n13, n14	PFn0,r0,PFn1,r1,PFn2,r2 PFn3,r3,PFn4,r4,PFn5,r5, PFn6,r6,PFn7,r7,PFn8,r8, PFn9,r9,PFn10,r10, PFn11,r11,PFn12,r12, PFn13,r13,PFn14,r14,	Respond to selected measurements See *1

*1

Query Format Example:

ALLMEAS? MODRF,n0,n1,n2,n3,n4,n5,n6,n7,n8,n9,n10,n11,n12,n13,n14

n0 to n14: Display returned values

1=Return measurements

0=Not return measurements

Number of Query parameters: 15.

Query Example:

ALLMEAS? MODRF,0,1,1,0,0,1,0,0,0,0,0,0,0,0,0

The query returns Carrier freq error, RMS Vector Error, Phase Error measurement values.

Response Format:

PFn0,r0,PFn1,r1,PFn2,r2,PFn3,r3,PFn4,r4,PFn5,r5,PFn6,r6,PFn7,r7,PFn8,r8,PFn9,r9,
PFn10,r10,PFn11,r11,PFn12,r12,PFn13,r13,PFn14,r14

PF:0=Pass,4=Fail,9=Measurement off

r0:Carrier Freq	r1:Carrier Freq Error	r2:RMS Vector Error
r3:Peak Vector Error	r4:Magunitude Error	r5:Phase Error
r6:Origin offset	r7:Bit Rate Error	r8:TX Power
r9:Carrier off Power	r10:On/Off Ratio	r11:Burst Timing
r12:Rising Time	r13:Falling Time	r14:Template

Response Example: (Carrier freq error,RMS Vector Error,Phase Error)

0,0.1,0,2.82,0,28.24

• Comment on the measurement results

The range and combination of the parameters used in the measurement results of the TX All Measure, is described below.

[Value of A]

MODANAL:	Modulation Analysis measurement
RFPOWER:	RF Power measurement
OBW:	Occupied Bandwidth measurement
ADJ:	Adjacent Channel Power measurement

[Value of n]

0: Pass

4: Fail

9: Off is set at Measure on the Setup TX All Measure Item screen.

[Value of r]

When n = 0 or 4, the measurement results are output with the set unit.

When n = 9, 0 is output.

[Combination of n with r]

When a = MODANAL:

n, CARRF, n, CARRFERR, n, VECTERR, n, PVECTERR, n, MAGTDERR, n, PHASEERR, n, ORGNOFS, n, BITRERR

When a = RFPWR:

n, TXPWR, n, OFFPWR, n, RATIO, n, BSTTIMING, n, RISETM, n, FALLTM, n, TEMPPASS

When a = OBW:

n, OBW, n, LOWER, n, UPPER

When a = ADJ:

n, LOWER2, n, LOWER1, n, UPPER1, n, UPPER2

Note: If the value of a is RFPWR, the TEMPPASS data is as follows:

Value of n	TEMPPASS
0	PASS
4	FAIL
9	0

2.5.7 RX tester commands

- Program messages of the RX tester commands are valid in ranges defined on RX test screens.
- Query messages of the RX tester commands are valid on all RX test screens.
- Level, Frequency, and Channel program messages of the Setup common parameter command are also valid on all measurement screens of the RX test. (See paragraph 2.5.4.)

(1) Setup RX meas parameter command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
BER Measure	Input data (BER)	Positive	EIBD POS	EIBD?	POS	
		Negative	EIBD NEG	EIBD?	NEG	
	Input data clock (BER)	Rise	EIBC RISE	EIBC?	RISE	
		Fall	EIBC FALL	EIBC?	FALL	
Frame structure	Frame structure	Frame	FRMSTRCT FRAME	FRMSTRCT?	FRAME	
		Super frame	FRMSTRCT SUPERFRAME	FRMSTRCT?	SUPERFRAME	
Differential phase encode	Differential phase encode	Normal	DPE NORM	DPE?	NORM	
		Invert	DPE INVS	DPE?	INVS	
RX Calibration	User cal factor Band1		RXUCALBA1 ℓ	RXUCALBA1?	ℓ	
	User cal factor Band2		RXUCALBA2 ℓ	RXUCALBA2?	ℓ	

(2) BER measure command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Frequency	Frequency		RFREQ f	RFREQ?	f	
			FR f	---	---	
			FC f	---	---	
	Channel		CHAN n	CHAN?	n	
	Incremental step	Value	FIS f	FIS?	f	
		Up	FRS UP	---	---	
			UFR	---	---	
		Down	FRS DN	---	---	
			DFR	---	---	
	Relative	Reference value	---	FRLR?	f	
		Value	---	FRLV?	f	
		On	FRL ON	FRL?	ON	
			FO	---	---	
		Off	FRL OFF	FRL?	OFF	
			FF	---	---	
Level	Output level		OLVL ℓ	OLVL?	ℓ	
			OL ℓ	---	---	
			AP ℓ	---	---	
	Incremental step	Value	OIS ℓ	OIS?	ℓ	
		Up	OLS UP	---	---	
			UOL	---	---	
		Down	OLS DN	---	---	
			DOL	---	---	
	Knob	Step up	OLK UP	---	---	
			TOL	---	---	
		Step down	OLK DN	---	---	
			EOL	---	---	
	Output level resolution	0.1,1,10dB	OLR ℓ	OLR?	ℓ	
	Relative	Reference value	---	ORLR?	ℓ	
		Value	---	ORLV?	ℓ	
		On	ORL ON	ORL?	ON	
			LO	---	---	
		Off	ORL OFF	ORL?	OFF	
			LF	---	---	
	Output level offset	Value	OOS ℓ	OOS?	ℓ	
		On	OOF ON	OOF?	ON	
		Off	OOF OFF	OOF?	OFF	
	Output level ON/OFF	On	LVL ON	LVL?	ON	
			RO	---	---	
		Off	LVL OFF	LVL?	OFF	
			RF	---	---	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Voltage display	EMF	VDSPL EMF	VDSPL?	EMF	
			SPØ3	---	---	
		TERM	VDSPL TERM	VDSPL?	TERM	
			SPØ4	---	---	
	Level continuous mode	On	OCNT ON	OCNT?	ON	
		Off	OCNT OFF	OCNT?	OFF	
	Unit	dBm	OLDBM	---	---	
			OLDM	---	---	
			APDBM	---	---	
			APDM	---	---	
		dBu	OLDBU	---	---	
			OLDU	---	---	
			APDBU	---	---	
			APDU	---	---	
	Calibration		CAL	---	---	
Modulation	Modulation	On	MOD ON	MOD?	ON	
		Off	MOD OFF	MOD?	OFF	
Bit error rate measurement	Counting time	10^2	CNTTM 2	CNTTM?	2	
		10^3	CNTTM 3	CNTTM?	3	
		2556	CNTTM 2556	CNTTM?	2556	
		10^4	CNTTM 4	CNTTM?	4	
		10^5	CNTTM 5	CNTTM?	5	
		10^6	CNTTM 6	CNTTM?	6	
		∞	CNTTM INF	CNTTM?	INF	
				CNTTM?	9 (other)	
			BERSAMPLE n	BERSAMPLE?	n	n:-1 (∞) to 99999999
Measurement	Start		BERSA	---	---	
	Stop		BERSO	---	---	
Measurement result	Error rate		---	BERRATE?	u	
	Error count		---	BERCNT?	n	
Measurement Result (Multi-response)			---	BERMEAS?	r0,r1,r2	Respond to all measurements See *1
			---	BERMEAS?	r0,r1,r2 n0,n1,n2	Respond to selected measurements See *1

*1

Query Format Example:

BERMEAS? n0,n1,n2

n0 to n2: Display returned values

1=Return measurements

0=Not return measurements

Number of Query parameters: 3.

Query Example:

BERMEAS? 0,0,1

The query returns Counting Time measurement value.

Response Format: r0,r1,r2

ri:Result data

r0:Error Rate

r1:Error Count

r2:Counting Time

Response Example: (Counting Time)

1000000

SECTION 3
SETUP

This section describes the RS-232C/GPIB connections to external devices and setting the remote-control interface of the MT8802A.

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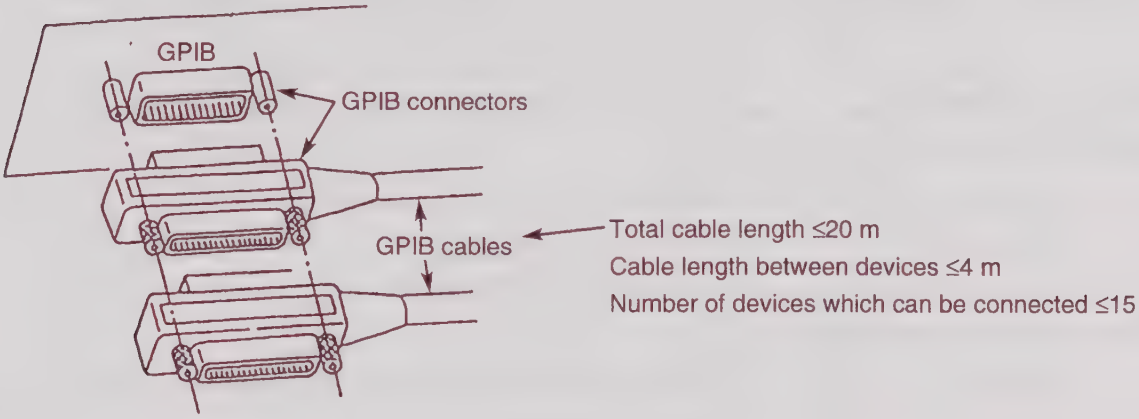
3.1 Connecting Devices with GPIB Cables

The rear panel has connectors for connecting GPIB cables.

Up to 15 devices, including the controller, can be connected to one system. Connect devices under the conditions described to the right of the diagram below.


GPIB
GPIB connectors
GPIB cables
Total cable length ≤20 m
Cable length between devices ≤4 m
Number of devices which can be connected ≤15

Mounting and dismounting of the GP-IB cable must be done after turning off the power switch and pulling out the power cord from the socket. If the power remains on, only signal common line may disconnected before the other lines, then AC leak voltages are applied to the ICs, and there is a possibility that components such as ICs in the interface unit will be damaged.

⚠ CAUTION

The GPIB cables must be connected before the power is turned on.

3.2 Setting GPIB Interface Conditions

Set the GPIB interface on the Instrument Setup screen at the front panel.

Set the following items:

1) Interface: Connect to Controller (Initial value: GPIB)

2) GPIB: Address (Initial value: 01)

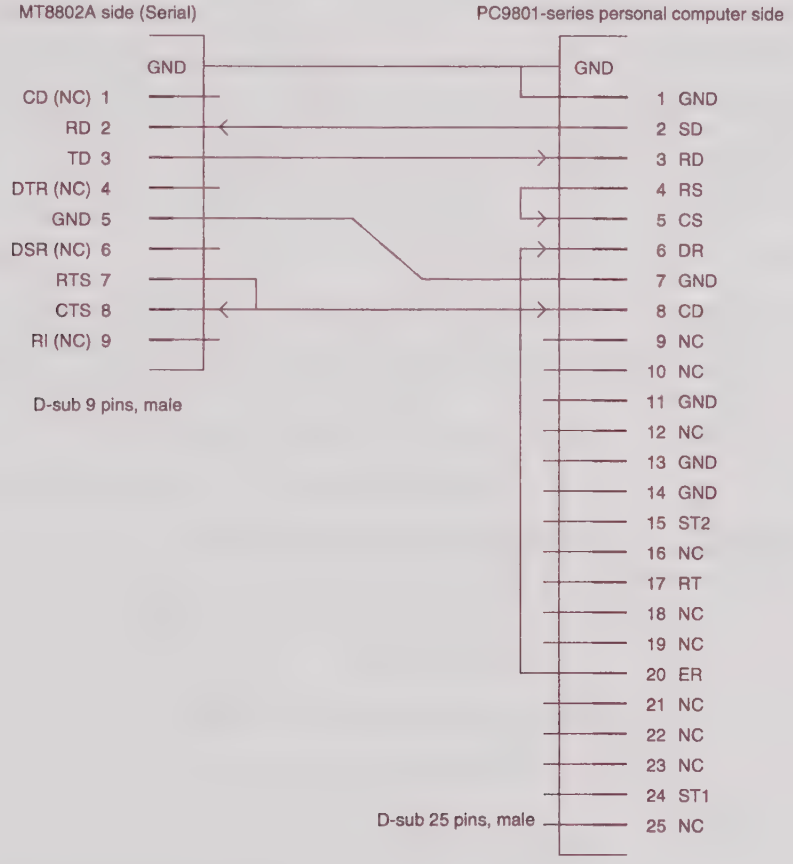
An example of the setting when the GPIB interface is set with the GPIB address03 is given below.

Step	Key operation	Explanation
(Switching to the Instrument Setup screen)		
1.	[Main Func on off] F6	Sets the Main Func on to display the main menu.
2.	Next Menu[◀]	Sets the Instrument Setup mode.
	[Instrument Setup] F1	Displays the Instrument Setup screen.
(Selecting the remote control interface)		
3.	Cursor [∧] [∨]	Uses these cursor keys to select "Interface Connect to Controller.".
4.	[Set]	Opens the setup window.
5.	Cursor [∧] [∨]	Selects GPIB on the setting window.
6.	[Set]	Closes the setting window and determines the set value.
(Setting the GPIB address)		
7.	Cursor [∧] [∨]	Use these cursor keys to select a GPIB address.
8.	[Set]	Opens the setup window.
9.	[0] [3] [Set]	Set the GPIB address to 03.

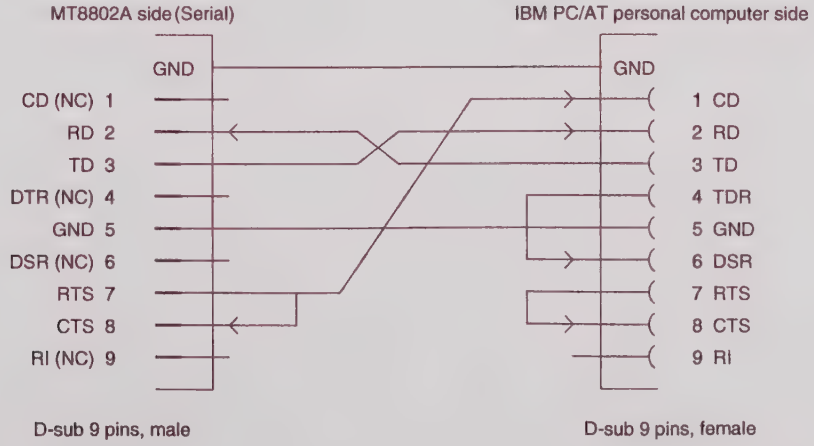
3.3 Connection of RS-232C Interface Signal

Connection of RS-232C interface signal between the MT8802A and a personal computer is shown below.

• Connection to PC98-series personal computer(NEC)



• Connection to IBM PC/AT personal computer



3.4 Setting RS-232C Interface Conditions

Set the RS-232C interface on the Instrument Setup screen at the front panel.

Set the following items:

1) Interface: Connect to Controller (Initial value: GPIB)

2) RS-232C: Baud Rate (Initial value: 2400)

Parity (Initial value: Even)

Data Bit (Initial value: 8 bits)

Stop Bit (Initial value: 1 bit)

Set the RS-232C interface conditions, as desribed below.

Step	Key operation	Explanation
(Switching to the Instrument Setup screen)		
1.	[Main Func On/Off] F6	Sets the Main Func on to display the main menu.
2.	Next Menu [◀]	Sets the Instrument Setup mode.
	[Instrument Setup] F1	Displays the Instrument Setup screen.
(Selecting the remote control interface)		
3.	Cursor [∧] [∨]	These cursor keys are used to select "Interface Connect to Controller."
4.	[Set]	Opens the setup window.
5.	Cursor [∧] [∨]	Selects RS-232C on the setting window.
6.	[Set]	Closes the setting window and establishes the set value.
(Setting the RS-232C interface)		
7.	Cursor [∧] [∨]	Uses these cursor keys to select the setting item Baud rate.
8.	[Set]	Opens the setup window.
9.	[∧] [∨] [Set]	Uses these cursor keys to select a Baud rate value (9600 [bps] etc.).
10.	[∧] [∨]	Sets other interface conditions in the same way.

3.5 Setting the Items Relating to Remote Control and Panel Key Control

3.5.1 Remote control and panel control keys

The keys and lamps described in this paragraph are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the MT8802A is controlled remotely via the GPIB interface. When the MT8802A is controlled remotely from an external controller via the GPIB interface on the rear panel, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled.The LOCAL key is used to cancel the remote control status of the GPIB interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary encoder entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary encoder entry from the front panel. Use the PANEL LOCK key to prevent an operation error on the front panel for automatic measurement or status holding. When the panel is locked, the red lamp on the PANEL LOCK key lights.

3.5.2 Remote control status

If the MT8802A is controlled remotely, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. To change from the remote control to front panel entry status, execute the following steps:

1) Halt the remote control.

2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.

SECTION 4
DEVICE MESSAGE FORMAT

This section describes the format of the device messages transmitted between a controller and the MT8802A via the GPIB system.

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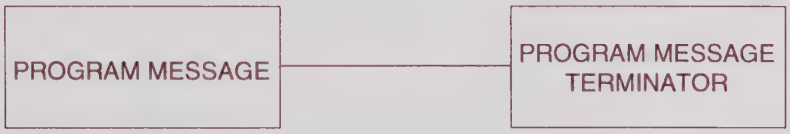
4.1 General Description

The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages:program messages output from the controller to the MT8802A, and response messages input from the MT8802A by the controller. There are also two types of program commands and program queries in the program message. The program command is used to set this instrument's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

4.2 Program Message Format

To transfer program messages from the controller to the MT8802A using the PRINT statement, the program message formats are defined as follows:

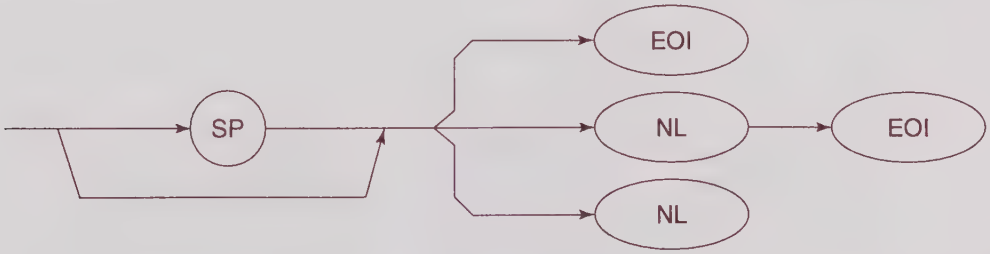



```
PRINT△@1,"TFREQ△ 3GHZ"
```

Program message

When the program message is transmitted from the controller to the MT8802A, the specified terminator is attached.

(1) PROGRAM MESSAGE TERMINATOR



NL : New line or LF (Line Feed)

EOI : The EOI signal of the GPIB interface is used to indicate message termination.

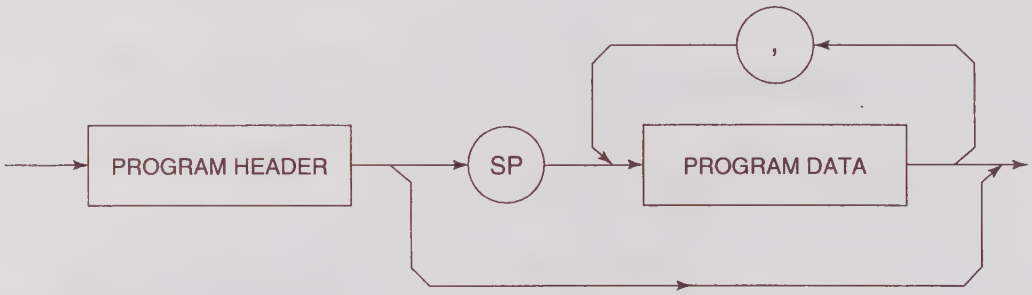
Cartridge Return (CR) is ignored, and is not processed as a terminator.

(2) PROGRAM MESSAGE

Multiple commands can be output sequentially by concatenating each of them with a semicolon.

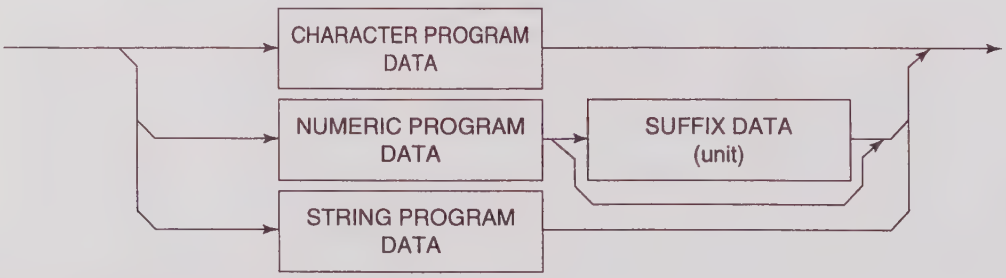
<Example> PRINT △ @1,"TFREQ △ 1GHZ;RFLVL △ UP"

(3) PROGRAM MESSAGE UNIT



- Each IEEE488.2 common command has a leading asterisk "*" that is always placed before the program header.
- The program query has a trailing question mark "?" that is always added at the end of the program header.

(4) PROGRAM DATA



(5) CHARACTER PROGRAM DATA

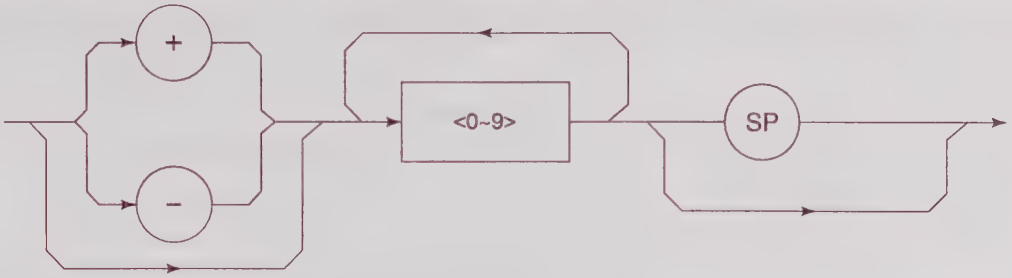
Character program data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9. These characters can be used in specified combinations.

<Example> PRINT △ @1, △ "MKR △ NRM" . . . . . Sets Marker to Normal.

(6) NUMERIC PROGRAM DATA

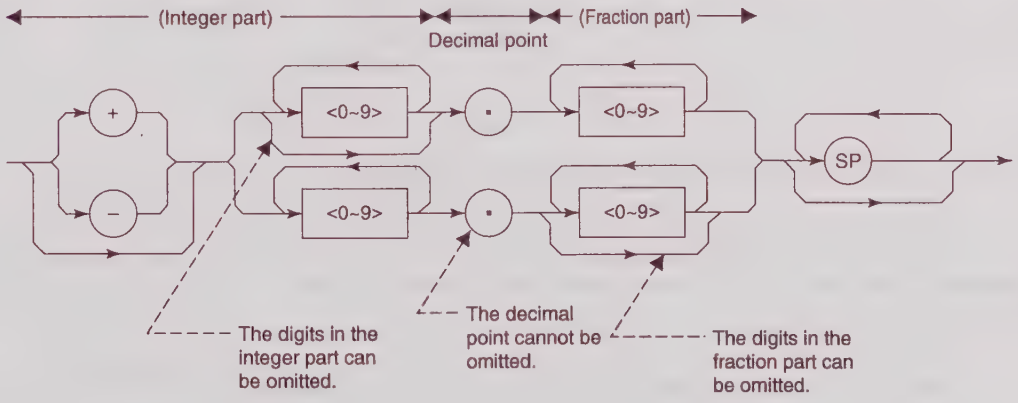
Numeric program data has two types of formats:integer format (NR1) and fixed-point real number format (NR2).

<Integer Format (NR1)>



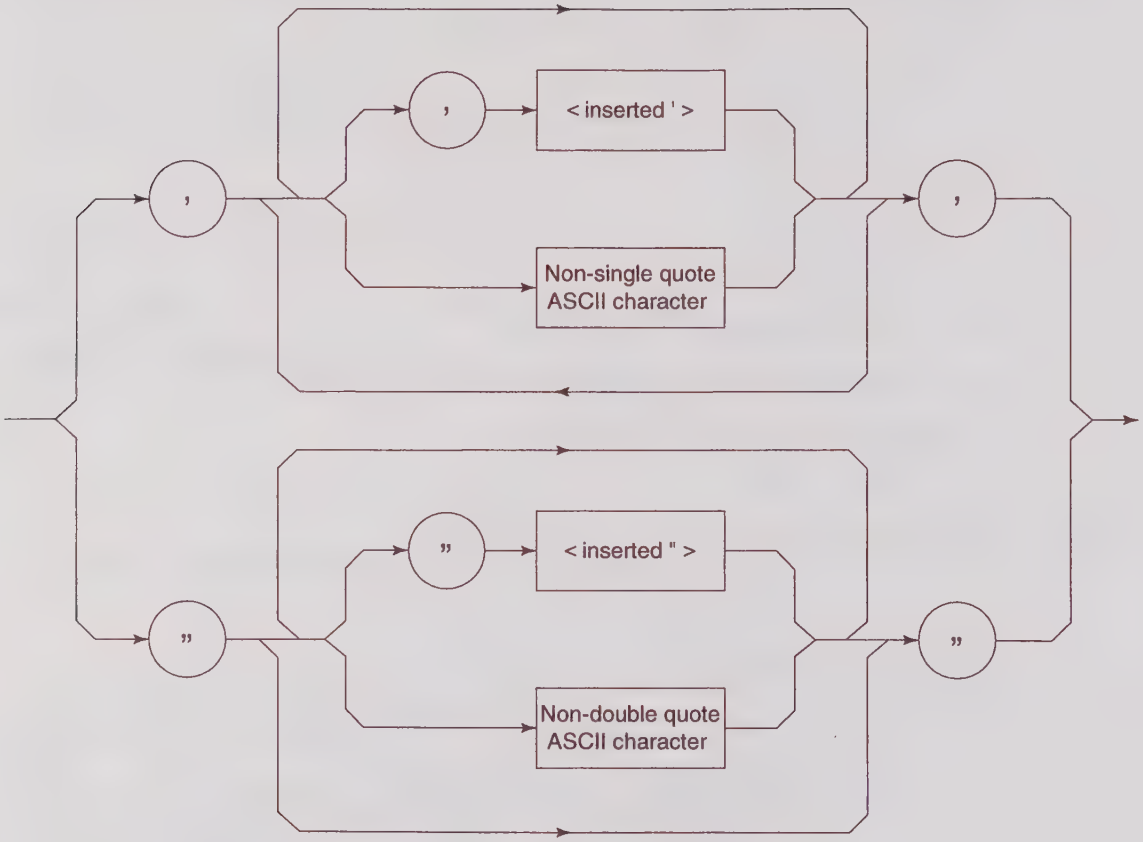
- Zeros can be inserted at the beginning. → 005, +000045
- No spaces can be inserted between a + or - sign and a number. → 5, +△5 (×)
- Spaces can be inserted after a number. → +5△△△
- The + sign is optional. → +5,5
- Commas cannot be used to separate digits. → 1,234,567 (×)

<Fixed-Point (real number) Format (NR2)>



- The numeric expression of the integer format is applied to the integer part.
- No spaces can be inserted between numbers and the decimal point. → +753△.123 (×)
- Spaces can be inserted between numbers and the decimal point. → +753.123△△△△
- A number may not always be placed before the decimal point. → .05
- A + or - sign can be placed before the decimal point. → +. 05, –.05
- A number can end with a decimal point. → 12.

(7) STRING PROGRAM DATA



•Both ends of string program data must have a pair of double quotation marks "___".

```
PRINT @1,"TITLE 'MT8802A'"
```

A single quotation mark used within the character string must be repeated as shown in ' or ".

```
PRINT @1,"TITLE 'MT8802A''NOISE MEAS''' "
```

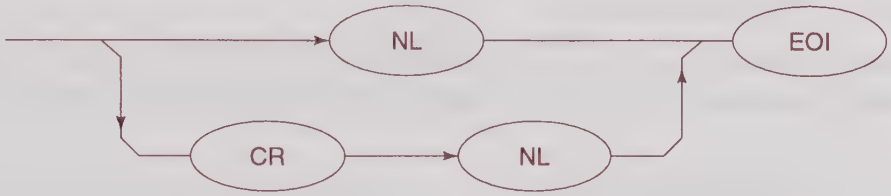
Executing TITLE results in MT8802A 'NOISE MEAS'.

Note: To use the double quotation mark " in the PRINT statement, specify CHR$ (&H22).

4.3 Response Message Format

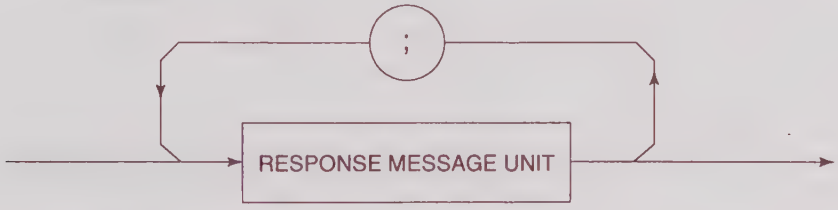
To transfer responses messages from the MT8802A to the controller by using the INPUT statement, the response message formats are defined as follows:

(1) RESPONSE MESSAGE TERMINATOR



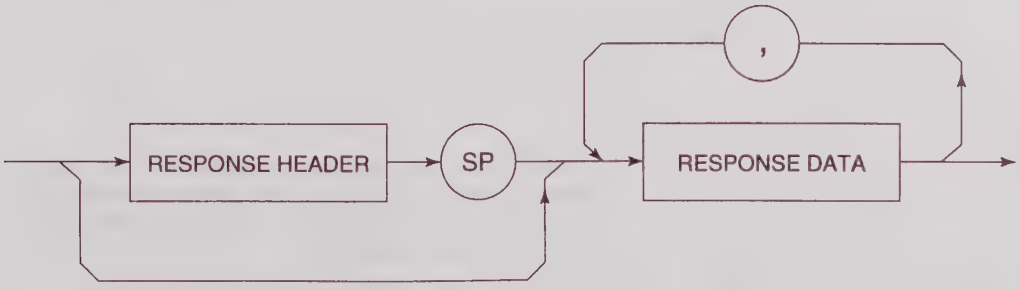
The response message terminator to be used depends on the TRM command.

(2) RESPONSE MESSAGE

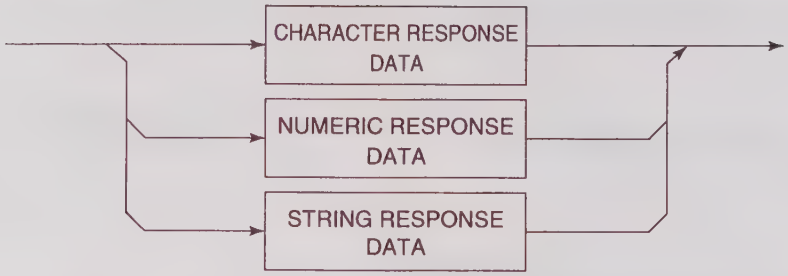


When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

(3) Normal RESPONSE MESSAGE UNIT



(4) RESPONSE DATA

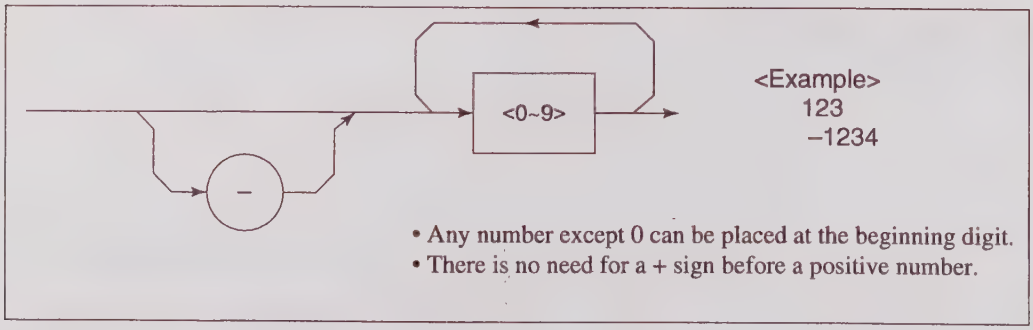


(5) CHARACTER RESPONSE DATA

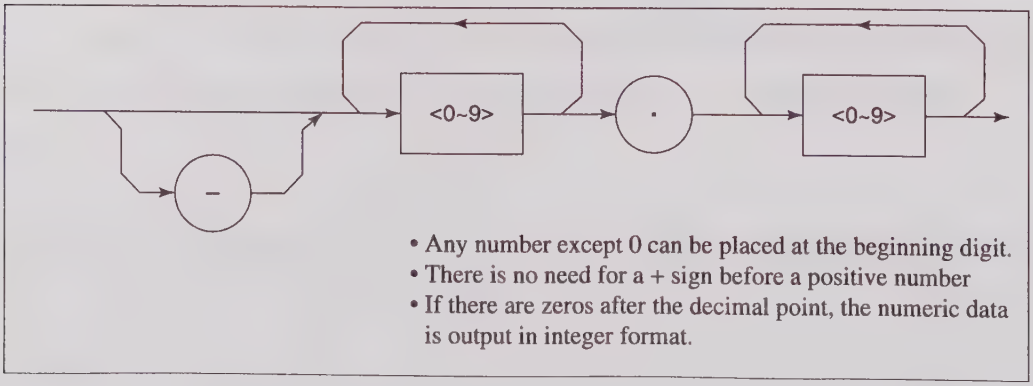
Character response data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9.These characters can be used in specified combinations.

(6) NUMERIC RESPONSE DATA

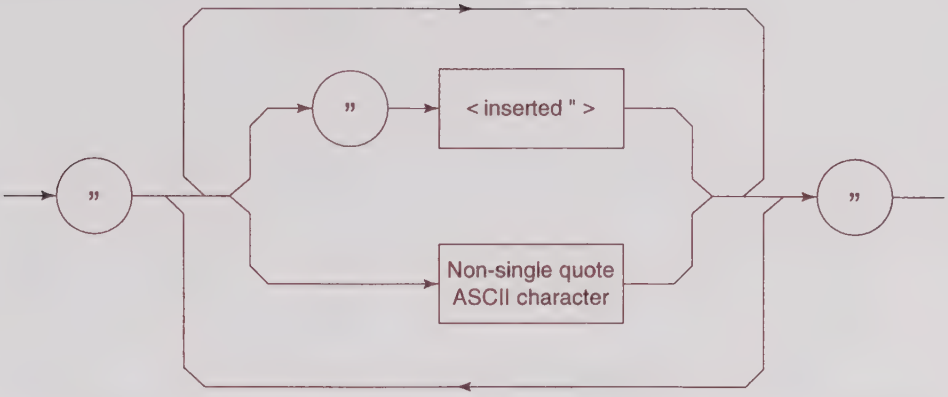
<Integer Format (NR1)>



<Integer Format (NR1)>


<0~9>
.
<0~9>
–
• Any number except 0 can be placed at the beginning digit.
• There is no need for a + sign before a positive number
• If there are zeros after the decimal point, the numeric data is output in integer format.

(7) STRING RESPONSE DATA



String response data is output as an ASCII character string, which is enclosed with double quotation marks.

(8) Response message to input the waveform data using binary data

For details on reading binary format, see paragraph 7.2 in Section 7, "SAMPLE PROGRAMS."

SECTION 5
STATUS MESSAGES

This section describes MT8802A status messages, their data structure and models, and explains the techniques for synchronizing the controller and the MT8802A.

To obtain more detailed status information, the IEEE488.2 standard has more common commands and common queries than the IEEE488.1 standard.

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The Status Byte (STB) sent to the controller is based on the IEEE488.1 standard. The bits comprising it are called a status summary message because they represent a summary of the current data contained in registers and queues.

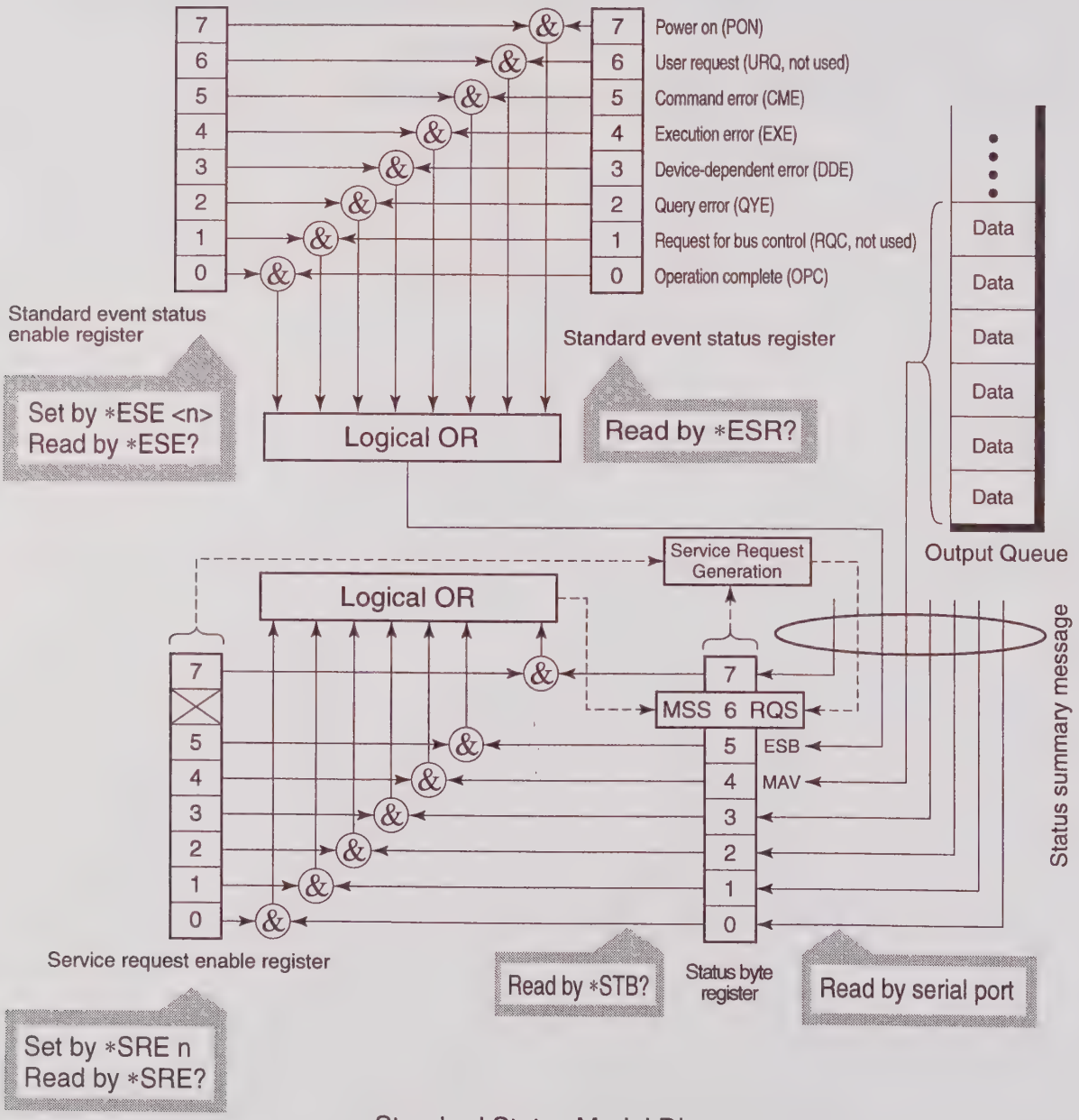
The following pages explain the status summary message and structure of status data that constitutes the status summary message bits, as well as techniques for synchronizing the MT8802A and controller, which use these status messages.

These functions are used by an external controller with the GPIB interface bus.

Almost functions can be used by an external controller with the RS-232C interface.

5.1 IEEE488.2 Standard Status Model

The diagram below shows the standard model for the status data structure stipulated in the IEEE488.2 standard.



Standard Status Model Diagram

The IEEE488.1 status byte is used in the status model. This status byte is composed of seven summary message bits given from the status data structure. To create the summary message bits, there are two models for the data structure:the register model and the queue model.

Register model	Queue model
The register model consists of the two registers used for recording events and conditions encountered by a device. These two registers are the Event Status Register and Event Status Enable Register. When the result of the AND operation of both register contents is not 0, the corresponding bit of the status bit becomes 1.In other cases, it becomes 0.And, when the result of their Logical OR is 1, the summary message bit also becomes 1.If the logical OR result is 0, the summary message bit also becomes 0.	The queue in the queue model is for sequentially recording the waiting status values and data. The queue structure is such that the relevant bit is set to 1 when there is data in it and 0 when it is empty.

In IEEE488.2, there are three standard models for status data structure, two register models and one queue model, based on the register model and queue model explained above. They are:

① Standard Event Status Register and Standard Event Status Enable Register
② Status Byte Register and Service Request Enable Register
③ Output Queue

Standard Event Status Register	Status Byte Register	Output Queue
The Standard Event Status Register has the structure of the previously described register model. In this register, bits are set for eight types of standard events encountered by a device. ① Power on, ②User request, ③Command error, ④Execution error, ⑤Device-dependent error, ⑥Query error, ⑦Request for bus control and ⑧Operation complete. The logical OR output bit is represented by Status Byte Register bit 5 (DIO6) as a summary message for the Event Status Bit (ESB).	The Status Byte Register is a register in which the RQS bit and the seven summary message bits from the status data structure can be set. It is used together with the Service Request Enable Register. When the result of the OR operation of both register contents is not 0, SRQ goes ON. To indicate this, bit 6 of the Status Byte Register (DIO7) is reserved by the system as the RQS bit, which indicates a service request for the external controller. The mechanism of SRQ conforms to the IEEE488.1 standard.	The Output Queue has the structure of the queue model mentioned above. Status Byte Register bit 4 (DIO5) is set as a summary message for Message Available (MAV) to indicate that there is data in the output buffer.

5.2 Status Byte (STB) Register

The STB register consists of device STB and RQS (or MSS) messages. The IEEE488.1 standard defines the method of reporting STB and RQS messages, but not the setting and clearing of protocols or the meaning of STB. The IEEE488.2 standard defines the device status summary message and the Master Summary Status (MSS) which is sent to bit 6 together with STB in response to an *STB? common query.

5.2.1 ESB and MAV summary messages

The following describes the ESB and MAV summary messages.

(1) ESB summary messages

The ESB (Event Summary Bit) summary message is a message defined by IEEE488.2, and is represented by bit 5 of the STB register. This bit indicates whether at least one of the events defined in IEEE488.2 has occurred when the service request enable register is set to enable events after the final reading or clearing of the standard event register.

The ESB summary message bit becomes 1 when the setting permits events to occur if any of the events recorded in the standard event status register becomes 1.The ESB summary bit becomes true when the setting permits events to occur if any of the events registered in the standard event status register is true. Conversely, it is false if none of the recorded events occurs even if events are set to occur.

This bit becomes FALSE (0) when the ESR register is read by the *ESR? query and the ESR register is cleared by the *CLS command.

(2) MAV summary messages

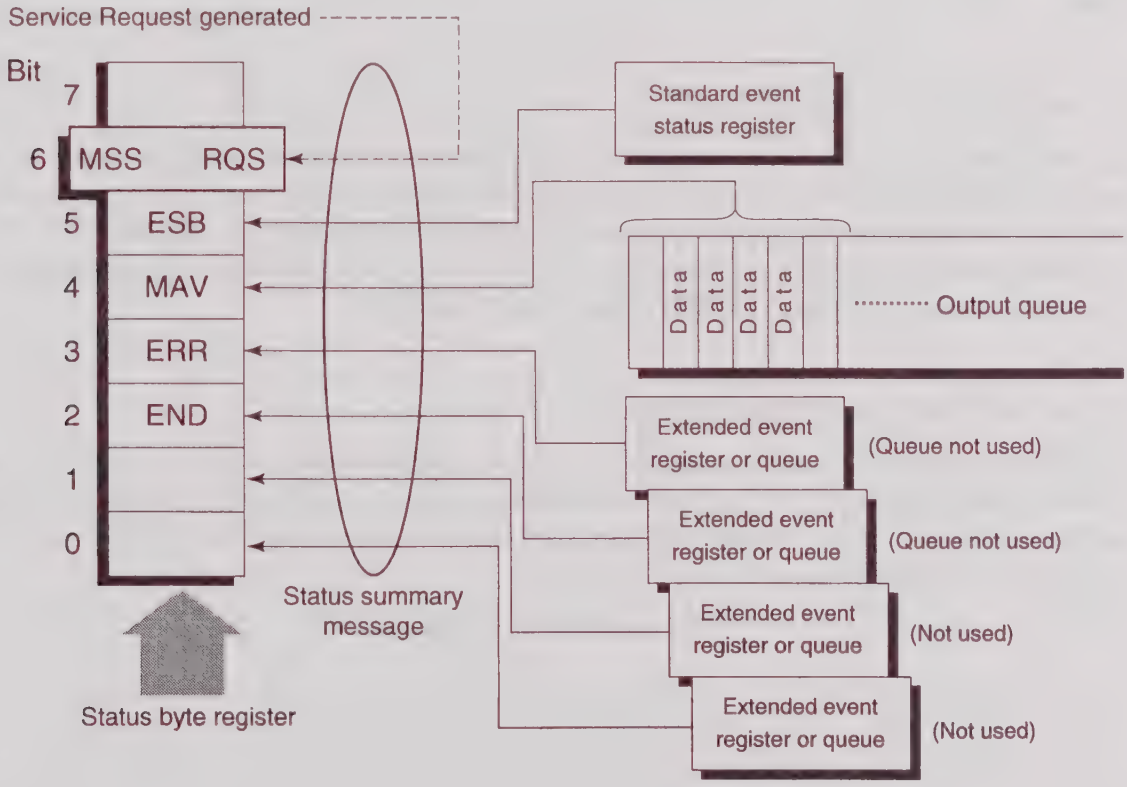
The MAV summary message is a message defined in IEEE488.2 and represented by bit 4 in the STB register. This bit indicates whether the output queue is empty. The MAV summary message bit is set to 1 (true) when a device is ready to receive a request for a response message from the controller and to 0 (false) when the output queue is empty. This message is used to synchronize the exchange of information with the controller. For example, this message can be used to make the controller wait until MAV is true after it sends a query command to the device. While the controller is waiting for a response from thedevice, it can process other jobs. Reading the output queue without first checking MAV delay all system bus operations until the device responds.

5.2.2 Device-dependent summary messages

The IEEE488.2 standard specifies that bits 7 (DIO8) and 3 (DIO4) to 0 (DIO1) of the status byte register can be used as status register summary bits, or to indicate that there is data in a queue.

Device-dependent summary messages have the respective status data structures of the register model or the queue model. Thus, the status data structure may be either the register to report events and status in parallel or the queue to report conditions and status in sequence. The summary bit represents a summary of the current status of the corresponding status data structure. For the register model, the summary message is true when there is an event set to permit the occurrence of more than one true event; while for the queue model, it is true if the queue is not empty.

As shown below, the MT8802A does not use bits 0, 1 and 7. As it uses bits 2 and 3 as the summary bit of the status register, it has 3 register model types (where 2 types are extended) and one queue model type(with no extension).



5.2.3 Reading and clearing the STB register

Serial poll or the *STB? common query are used to read the contents of the STB register. STB messages conforming to IEEE488.1 can be read by either method, but the value sent to bit 6 (position) is different for each message.
The STB register can be cleared by using the *CLS command.

(1) Reading by serial poll (only when using the GPIB interface)

When using serial poll conforming to IEEE488.1, the device must return a 7-bit status byte and an RQS message bit which conforms to IEEE488.1.According to IEEE488.1, the RQS message indicates whether the device sent SRQ as true or not. The value of the status byte is not changed by serial poll. The device must set the RQS message to false immediately after being polled. As a result, if the device is again polled before there is a new cause for a service request, the RQS message is false.

(2) Reading by the *STB common query

The *STB? common query requires the device to send the contents of the STB register and an integer format response message from the MSS (Master Summary Status) summary message. The response represents the total binary weighted value of the STB register and the MSS summary message. STB register bits 0 to 5 and 7 are weighted to 1, 2, 4, 8, 16, 32, and 128; and the MSS to 64, respectively. Thus, excepting the fact that bit 6 represents the MSS summary message instead of the RQS message, the response to *STB? is identical to that for serial poll.

(3) Definition of MSS (Master Summary Status)

MSS indicates that there is at least one cause for a service request. The MSS message is represented by bit 6 in a device response to the *STB? query, but it is not generated response to serial poll. In addition, it is not part of the status byte specified by IEEE488.1.MSS is generated by the logical OR operation of the STB register with SRQ enable (SRE) register. In concrete terms, MSS is defined as follows:

(STB Register bit0 AND SRE Register bit0)

OR

(STB Register bit1 AND SRE Register bit1)

OR

:

:

(STB Register bit5 AND SRE Register bit5)

OR

(STB Register bit7 AND SRE Register bit7)

Since bit-6 status of the STB and SR enable registers is ignored in the definition of MSS, it can be considered that bit-6 status is always being 0 when calculating the value of MSS.

(4) Clearing the STB register by the *CLS common command

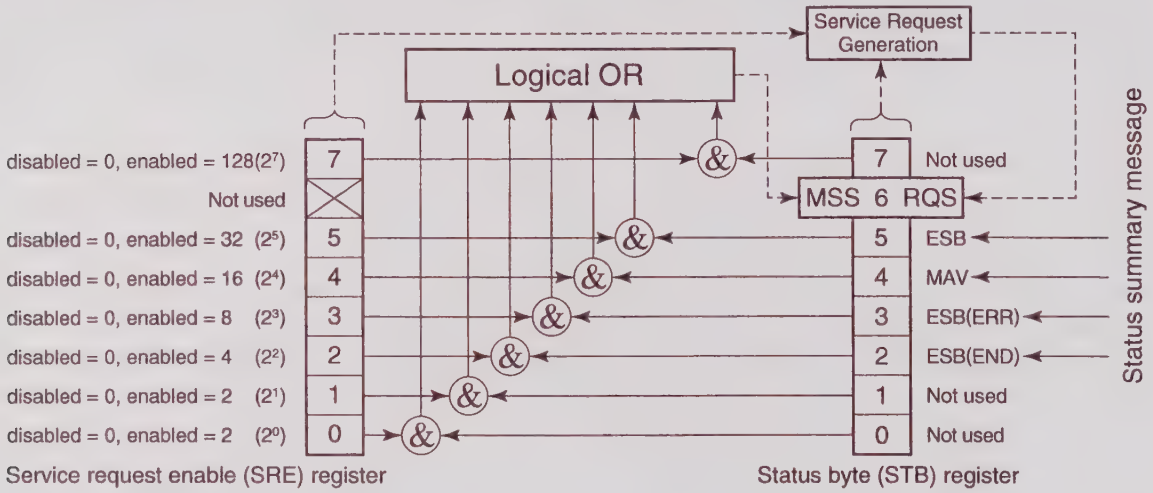
With the exception of the output queue and its MAV summary message, the *CLS common command clears all status data structures (status event registers and queues) as well as the corresponding summary messages.

The *CLS command does not affect settings in the enable registers.

5.3 Enabling the Service Request (SRQ)

All types of summary messages in the STB register can be enabled or disabled for service requests (SRE) by using the program-controlling service request (SRQ) enable operation. The service request enable (SRE) register controls the generation of SRQ in bits 0 to 7 as shown in the diagram below.

Bits in the service request enable register correspond to bits in the status byte register. If a bit in the status byte corresponding to an enabled bit in the service request enable register is set to 1, the device makes a service request to the controller with the RQS bit set to 1.For example, if bit 4 in the service request enable register is enabled, the device makes a request for service to the controller each time the MAV bit is set to 1 when there is data in the output queue.



(1) Reading the SRE register

The contents of the SRE register are read using the *SRE? common query. The response message to this query is an integer from 0 to 255, which is the sum of the bit digit weighted values in the SRE register. SRE register bits 0 to 5 and 7 are respectively weighted to 1, 2, 4, 8, 16, 32, and 128.The unused bit 6 must always be set to 0.

(2) Updating the SRE register

The *SRE common instruction is used to write data to the SRE register. An integer from 0 to 255 is added after the *SRE. fm3common instruction.

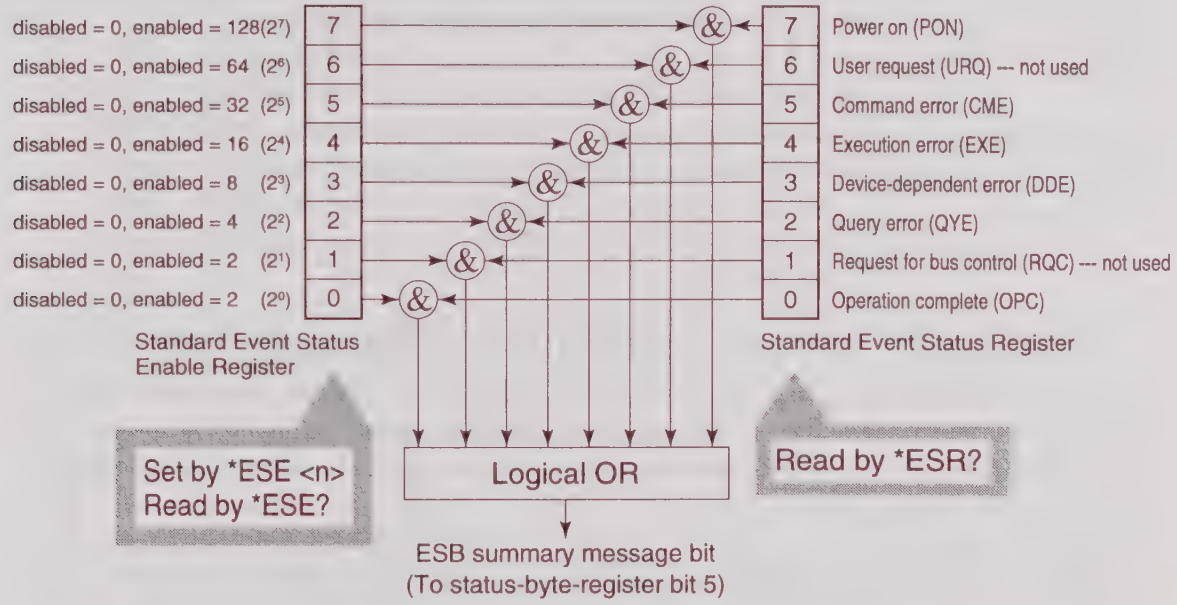
This integer indicates the total number of bits in the SRE register (weighted values:1, 2, 4, 8, 16, 32, and 128), and sets the corresponding SRE register bit to 0 or 1.

A bit value of 1 indicates an enabled state; 0 indicates a disabled state. Always ignore the value of bit 6.

5.4 Standard Event Status Register

5.4.1 Bit definition of standard event status register

The standard event status register must be available on all devices conforming to the IEEE488.2 standard. The diagram below shows the operation of the standard event status register model. Because the operation of the model is the same as that for the other models already described, the following only explains the meaning of each bit in the standard event status register as defined in the IEEE488.2 standard.



Standard event status enable (ESE) register selects whether the register makes the summary message true when the corresponding bit of the event status register is set.

Bit	Event name	Description
7	Power on (PON)	The power is turned on.
6	User Request (URQ)	Request for local control (rtl). This bit is produced regardless of whether a device is in remote or local mode. It is not used for the MT8802A so, it is always set to 0.
5	Command Error (CME)	An illegal program message, a misspelt command or a GET command within a program is received.
4	Execution error (EXE)	A legal program message, which cannot be executed, is received.
3	Device-dependent Error (DDE)	An error caused by other than CME, EXE or QYE (e.g., parameter error) occurred.
2	Query Error (QYE)	An attempt is made to read data in the output queue though there is none there, or data is lost from the output queue due to some reason (e.g., overflow).
1	Request Control (RQC)	A device is requesting an active controller.This bit is not used for the MT8802A so, it is always set to 0.
0	Operation Complete (OPC)	A device has completed specified operations and is ready to receive new commands. This bit is only set in response to the *OPC command.

5.4.2 Query error details

No.	Item	Description
1	Incomplete program message	If a device receives an MTA from the controller before it receives the terminator of the program message it is receiving, it aborts the incomplete program message and waits for the next one. To abort the incomplete message, the device clears its input-output buffer, reports a query error to the status report section and sets bit 2 in the standard status register to indicate the query error.
2	Interruption of response message output	If a device receives an MLA from the controller before it has sent the terminator of the response message it is sending, it automatically interrupts response message output and waits for the next program. To interrupt the response message output, the device clears its output buffer, reports a query error to the status report section, and sets bit 2 in the standard status register to indicate the query error.
3	Sending the next program message without reading the previous response message	When a device becomes unable to send a response message because the controller has sent another program message immediately following a program or query message, the device aborts the response message and waits for the next program message. It then reports a query error to the status report section as in No.2 above.
4	Output queue overflow	When several program and query messages are executed in succession, too many response messages for the output queue (256 bytes) may be generated. If further query messages are received when the output queue is full, the output queue cannot send corresponding responses due to the overflow situation. If there is overflow in the output queue, the device clears it and resets the section where response messages are created. Then it sets bit 2 in the standard event status register to indicate a query error.

5.4.3 Reading, writing to and clearing the standard event status register

Reading	The register is read by the *ESR? common query. The register is cleared after being read. The response message is an integer format data value obtained by binary weighting the event bit and converting it to a decimal number.
Writing	With the exception of clearing, writing operations cannot be performed externally.
Clearing	The register is only cleared in the following cases: ①A *CLS command received. ②The power is turned on. Devices first clear their standard event status registers but later record events that occurred during the sequence in the registers (e.g., setting of the PON event bit). ③An event is read for the *ESR? command.

5.4.4 Reading, writing to and clearing the standard event status enable register

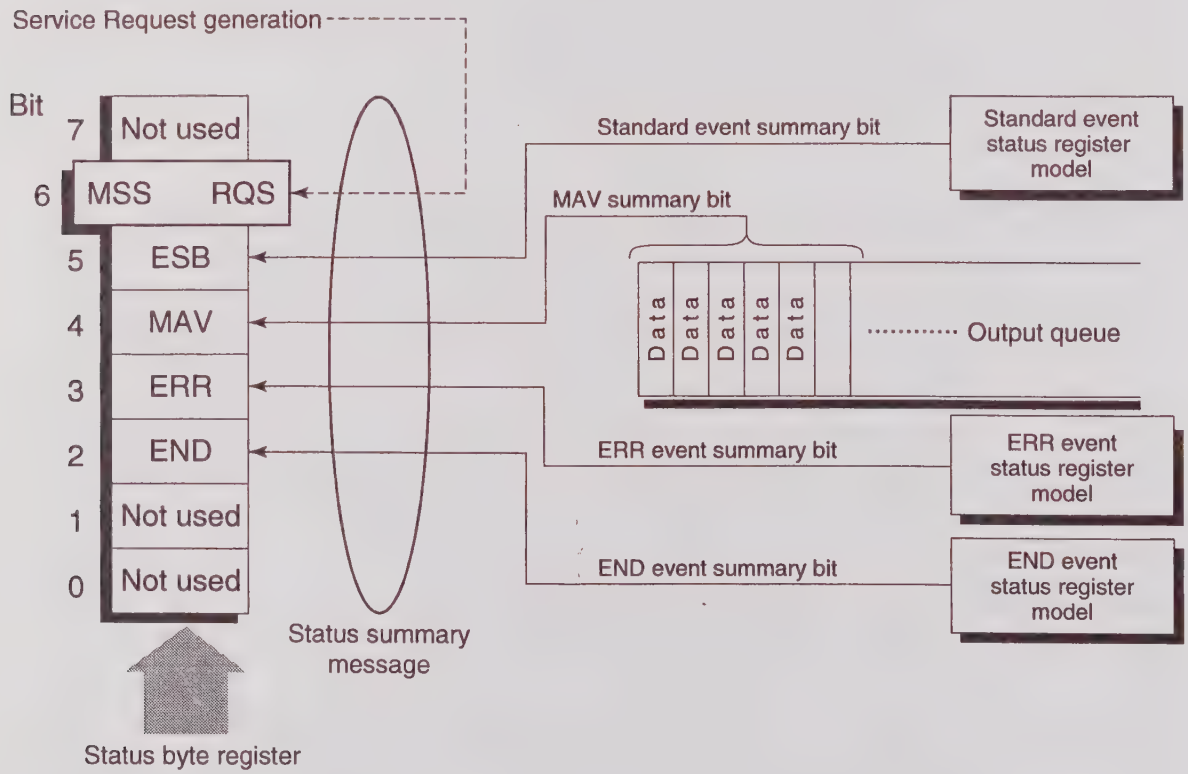
Reading	The register is read by the *ESE? common query. The response message is an integer format data value obtained by binary weighting the event bit and converting to a decimal number.
Writing	The register is written to by the *ESE common command. As bits 0 to 7 of the register are respectively weighted to 1, 2, 4, 8, 16, 32, 64, and 128, data to be written is sent by <DECIMAL NUMERIC PROGRAM DATA> which is the digit total of the bits selected from these bits.
Clearing	The register is cleared in the following cases: ①An *ESE command with a data value of 0 is received. ②The power is turned on. The standard event status enable register is not affected by the following: ①Changes of the status of the IEEE488.1 device clear function ②An *RST common command is received. ③A *CLS common command is received.

5.5 Extended Event Status Register

The register models of the status byte register, standard event status register and enable registers are mandatory for equipment conforming to the IEEE488.2 standard.

In IEEE488.2, status-byte-register bits 7 (DIO8), 3 (DIO4) to 0 (DIO1) are assigned to status summary bits supplied by the extended-register and extended-queue models.

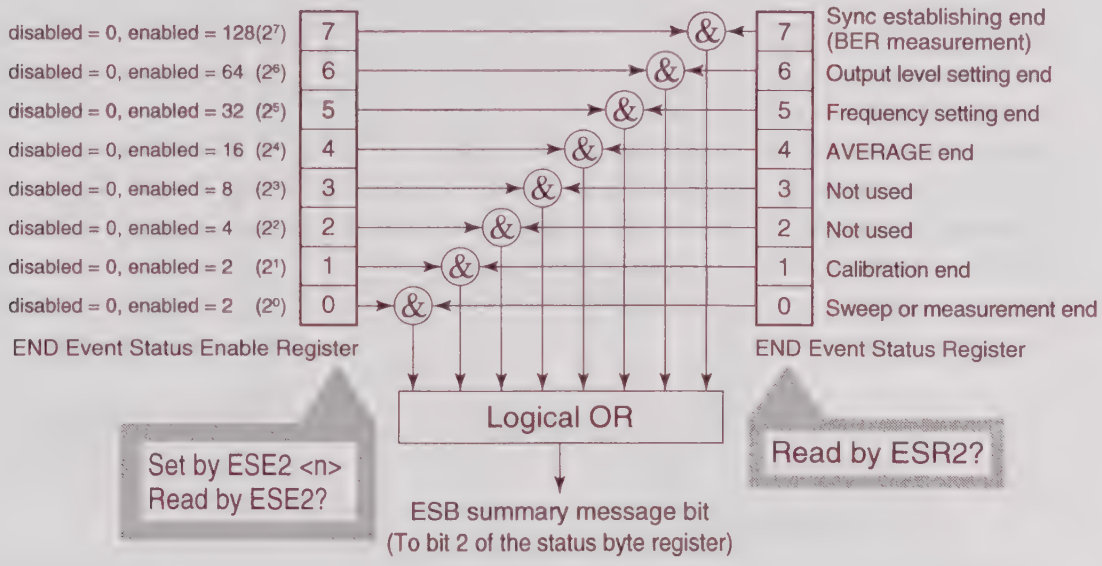
For the MT8802A, as shown in the diagram below, bits 7, 1 and 0 are unused; bits 2 and 3 are assigned to the END and ERR summary bits as the status-summary bits supplied by the extended-register model. As the queue model is not extended, there is only one type of queue: the output queue.



The following pages describe bit definition, the reading, writing to and clearing of bits for the END extended event register model.

5.5.1 Bit definition of END event status register

The following describes the operation of the END event status register model, the naming of its event bits, and what they mean.

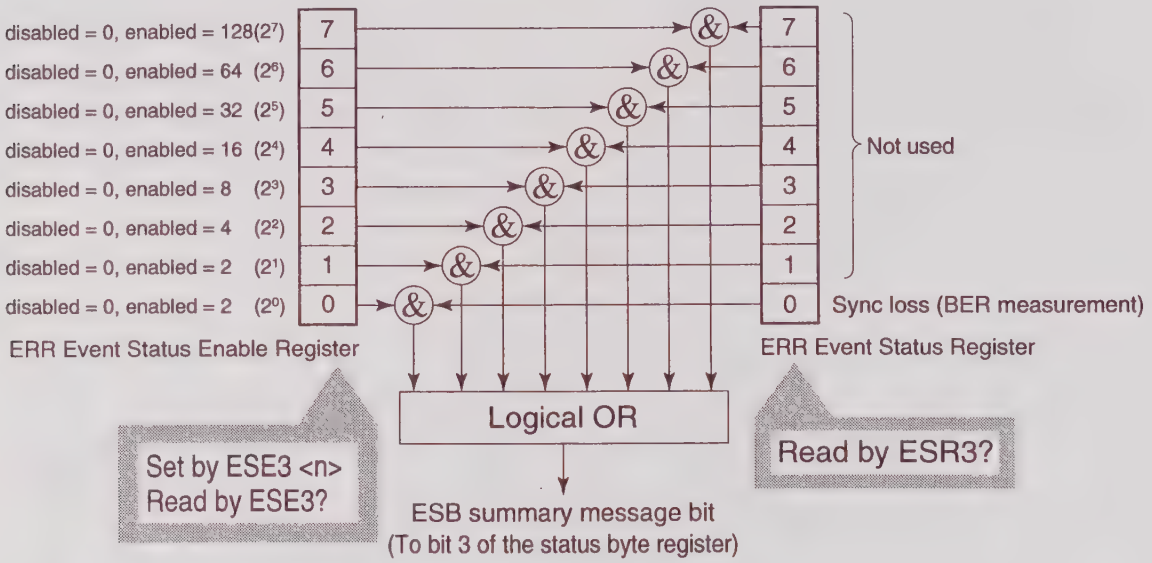


The END event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

Bit	Event name	Description
7	Sync establishing end	This bit is set to 1 when synchronization is established after BER measurement starts.
6	Output level setting end	This bit is set to 1 when output level setting ends.
5	Frequency setting end	This bit is set to 1 when frequency setting ends.
4	AVERAGE end	This bit is set to 1 when averaging ends.
3	(Not used)	(Not used)
2	(Not used)	(Not used)
1	CAL end	This bit is set to 1 when calibration ends.
0	Sweep or measurement end	This bit is set to 1 when sweep or measurement ends.

5.5.2 Bit definition of ERR event status register

The following describes the operation of the ERR event status register model, the naming of its event bits, and what they mean.



The ERR event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

Bit	Event name	Description
7	(Not used)	(Not used)
6	(Not used)	(Not used)
5	(Not used)	(Not used)
4	(Not used)	(Not used)
3	(Not used)	(Not used)
2	(Not used)	(Not used)
1	(Not used)	(Not used)
0	Sync loss	This bit is set to 1 when synchronization loss is occurred.

5.5.3 Reading, writing to and clearing the extended event status register

Reading	The register is destructively read by a query (e.g., it cleared after being read). The END/ERR event status register is read by ESR2?/ESR3? query. The read value, an integer format data (NR1), is obtained by binary weighting the event bit and converting it to decimal.
Writing	With the exception of clearing, writing operations cannot be performed externally.
Clearing	The register is cleared in the following cases: ① A *CLS command is received. ② The power is turned on. ③ An event is read by the ESR2?/ESR3? query command.

5.5.4 Reading, writing to and clearing the extended event status enable register

Reading	The register is non-destructively read by a query (i.e., not cleared after being read). The END/ERR event status register is read by the ESE2?/ESE3? query. The read value, an integer format data (NR2), is obtained by binary total weighting the event bit and converting it to decimal.
Writing	The END/ERR event status register is written to by the ESE2/ESE3 program command. As bits 0 to 7 of the registers are respectively binary weighted to 1, 2, 4, 8, 16, 32, 64, and 128, write data is sent as the integer format data obtained by total weighting the digit value of bits selected from among them.
Clearing	The register is cleared in the following cases: ① The ESE2/ESE3 program command with a data value of 0 is received for the END/ERR event status register. ② The power is turned on the power-on-status-clear flag is true. The extended event status enable register is not affected by the following: ③ Changes of the status of the IEEE488.1 device clear function ④ An *RST common command is received. ⑤ A *CLS common command is received.

5.6 Techniques for Synchronizing the MT8802A with a Controller

The MT8802A usually treats program messages as sequential commands that do not execute the processing of newly received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between the MT8802A and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MT8802A have been processed, the next commands must be sent to other devices.

There are five ways of synchronizing the MT8802A with the controller:

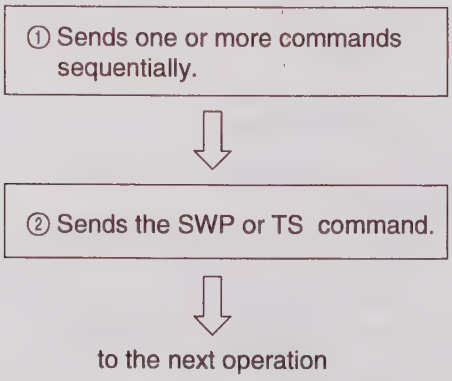
① Wait for SWP or TS command termination.
② Wait for a response after the *OPC? query is sent.
③ Wait for SRQ after *OPC is sent.
④ Wait for status generation of the status register.
⑤ Wait for SRQ by the status register.

5.6.1 Wait for SWP or TS command termination

When the MT8802A starts measurement using the SWP or TS command, it stops accepting the next measurement command until it terminates the measurement. Use this feature to set a synchronization.

Note: A response may not be returned if there is no measurement termination condition (permanent measurement of BER, etc.). In Average measurement mode, a response may be returned before averaging.

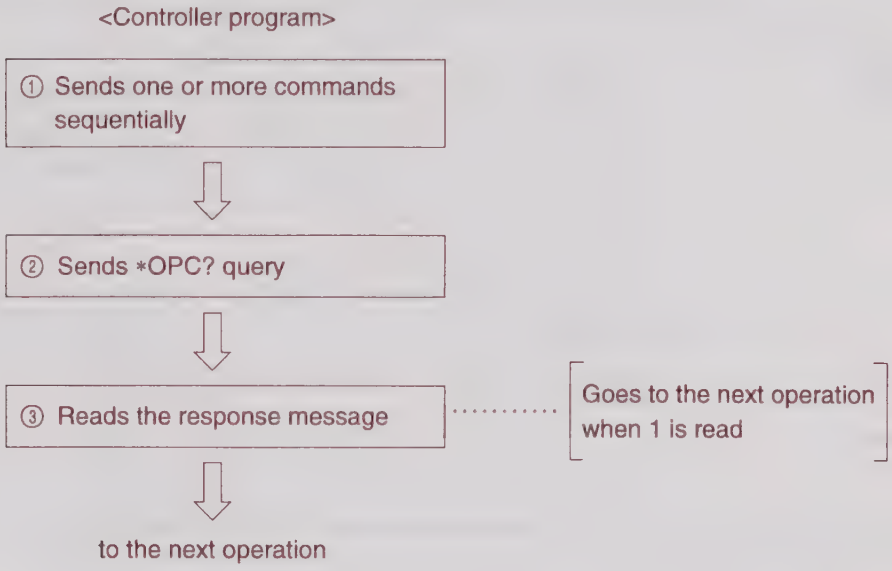
<Controller program>



5.6.2 Wait for response after *OPC? query is sent

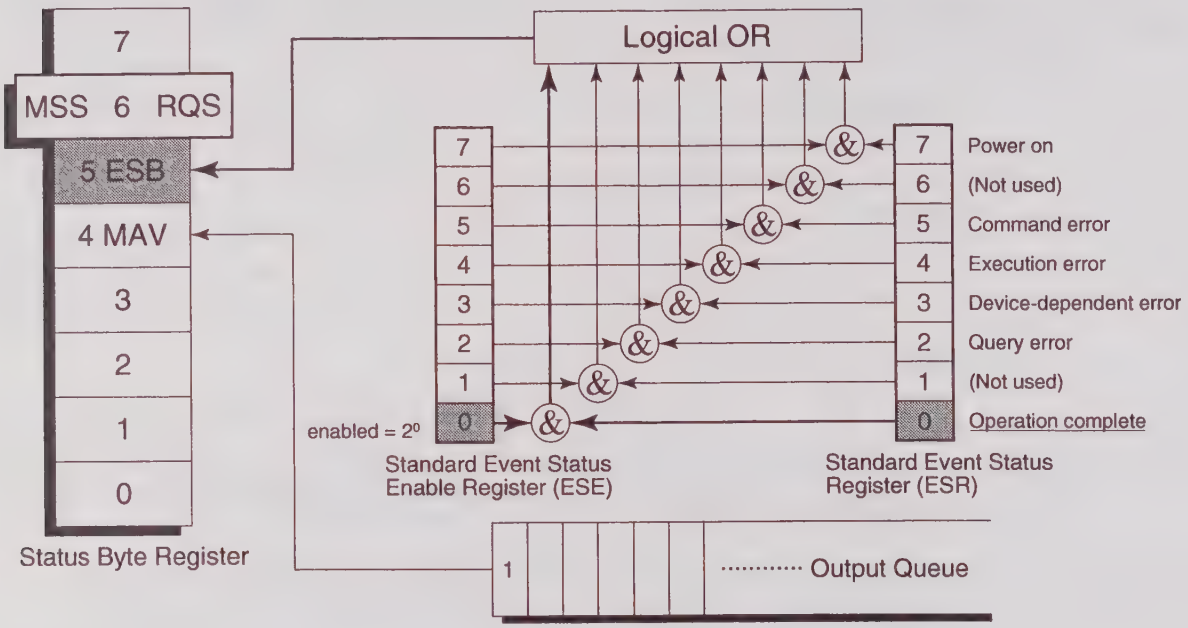
When executing the *OPC? query command, the MT8802A outputs "1" as the response message at the end of the previous command. The controller is synchronized with the MT8802A by waiting for the request message to be entered.

Note: When the read response message is "Q" (command is being executed), wait for about 50 ms until the controller moves to the next operation.



5.6.3 Wait for service request after *OPC is sent

The MT8802A sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MT8802A by waiting for SRQ when the operation-complete bit is set for SRQ.



• <Controller program>

① Enables the 20 bit (1) of the Standard Event Status Enable Register — `PRINT△@1;"*ESE△1"`

② Enables the 25 bit (32) of the Service Request Enable Register — `PRINT△@1;"*SRE△32"`

③ Makes the device execute the specified operation

④ Sends the *OPC command — `PRINT△@1;"*OPC"`

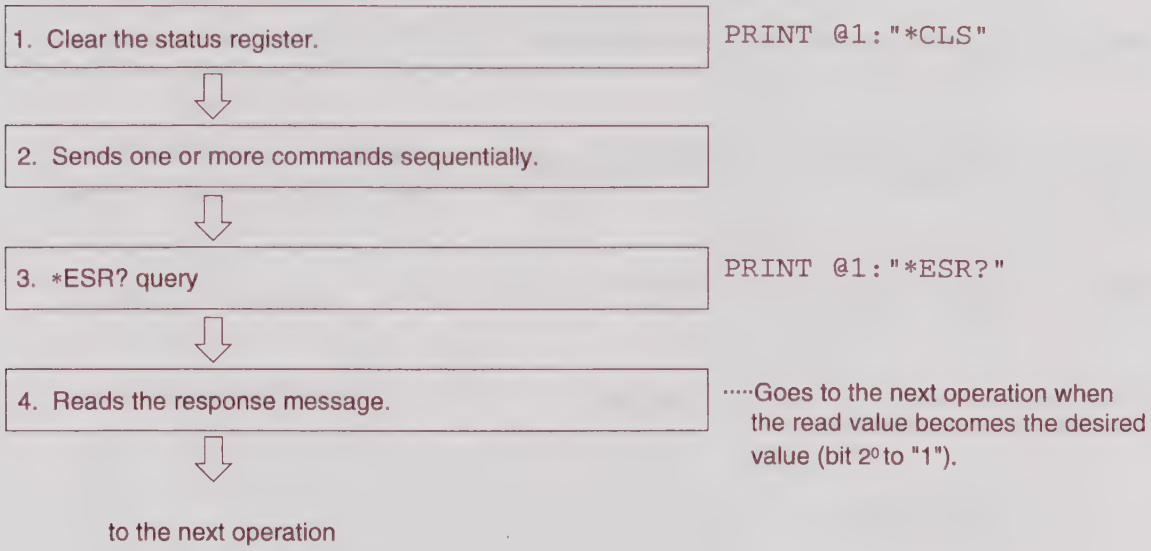
⑤ Wait for an SRQ interrupt (ESB summary message) ····· Value of status byte: $2^6 + 2^5 = 96$

5.6.4 Wait for status generation of the status register

An event status register bit of the MT8802A is set to 1 when the corresponding event occurs.When the *ESR?, ESR2?, or ESR3? query is executed, the MT8802A outputs the value of the corresponding status register as a response message. The controller reads this response message and waits until the response becomes the specified value for synchronization.Reset the event status register immediately before making a desired event occur.

Note: Wait for 50 ms for the controller to go to the next operation after reading a response message.

• <Controller program : Synchronization by operation termination bit>


1. Clear the status register.
PRINT @1:"*CLS"
2. Sends one or more commands sequentially.
3. *ESR? query
PRINT @1:"*ESR?"
4. Reads the response message.
·····Goes to the next operation when the read value becomes the desired value (bit 2⁰ to "1").
to the next operation

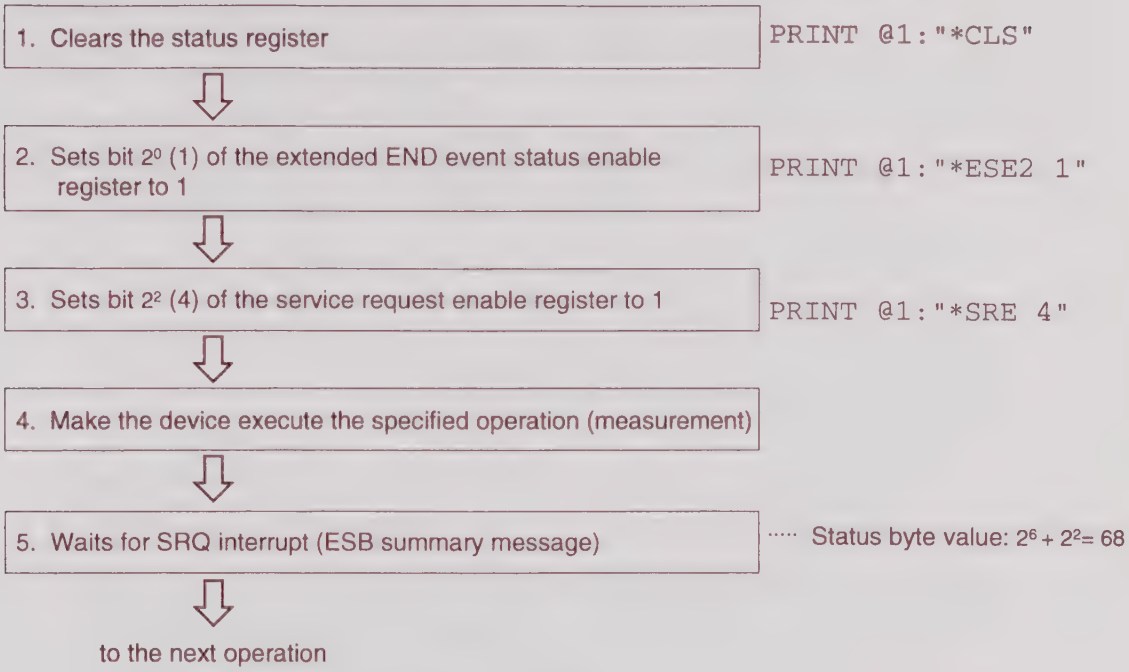
5.6.5 Wait for service request issuance from the status register

An event status register bit of the MT8802A is set to 1 when the corresponding event occurs. After setting these bits to set the RQS, the controller waits the SRQ for synchronization. Reset the event status register immediately before making a desired event occur.

• <Controller program 1: Synchronization by operation termination bit>

1. Clears the status register.	`PRINT @1:"*CLS"`
⇩	
2. Sets bit 2^0 of the standard event status enable register to 1.	`PRINT @1:"*ESE 1"`
⇩	
3. Sets bit 2^5 (32) of the service request enable register to 1.	`PRINT @1:"*SRE 32"`
⇩	
4. Makes the device execute the specified operation.	
⇩	
5. Waits for SRQ interrupt (ESB summary message).	····· Status byte value: $2^6 + 2^5 = 96$
⇩	
to the next operation	

• <Controller program 2: Synchronization by the sweep/measurement termination bit>


1. Clears the status register
PRINT @1:"*CLS"
2. Sets bit 2⁰ (1) of the extended END event status enable register to 1
PRINT @1:"*ESE2 1"
3. Sets bit 2² (4) of the service request enable register to 1
PRINT @1:"*SRE 4"
4. Make the device execute the specified operation (measurement)
5. Waits for SRQ interrupt (ESB summary message)
····· Status byte value: 2⁶ + 2²= 68
to the next operation

SECTION 6
INITIAL SETTINGS

This section outlines initialization for the system and describes how to initialize the system.
An example of initial settings are written for IBM-PC commands.

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6.1 General Description

There are three levels of initialization for the GPIB system.

The first level is bus initialization using the IFC statement with the system bus in the idle state.

The second level is initialization for message exchange using the DCL command to enable devices to receive program messages.

The third level is device initialization using the PRE or *RST command to initialize device functions. These levels of initialization prepare a device for operation.

A device must be set to a known state when the power is switched on.

Level	Initialization type	Description	Level combination and sequence
1	Bus initialization	The IFC message from the controller initializes all interface functions connected to the bus.	Can be combined with other levels, level 1 must be executed before level 2.
2	Initialization for message exchange	The message exchanges of all devices and specified devices on the GPIB are initialized respectively by the DCL (Device Clear) and SDC (Select Device Clear) GPIB bus commands, which also nullify the function that reports to the controller that operation has completed.	Can be combined with other levels, level 2 must be executed before level 3.
3	Device initialization	The *RST or PRE/INI/IP command returns the specified device to the device-dependent known state, regardless of the conditions of previous device use.	Can be combined with other levels; level 3 must be executed after levels 1 and 2.

The following paragraph describes the commands for executing levels 1, 2, and 3, and the items initialized by execution. It also describes the known state which is set when the power is switched on.

When controlling with an external controller through the GPIB interface bus, all the initialization functions of the first/second/third levels can be used.

When controlling with an external controller through the RS-232C interface port, the initialization function of the third level (device initialization) can be used. The initialization functions of the first/second levels cannot be used.

6.2 Bus Initialization by the IFC Statement

■ Example

```
ISET△IFC
```

■ Explanation

IThe IFC statement initializes the interface functions of all devices connected to the GPIB bus line.

The initialization of interface functions involves erasing the settings (e.g. talker, listener) made by the controller and resetting to the initial states. In the table below, ○ indicates the initialized functions; △ indicates partially initialized functions.

No	Function	Symbol	Initialization by IFC
1	Source handshake	SH	○
2	Acceptor handshake	AH	○
3	Talker or extended talker	T or TE	○
4	Listener or extended listener	L or LT	○
5	Service request	SR	△
6	Remote/local	RL	
7	Parallel poll	PP	
8	Device clear	DC	
9	Device trigger	DT	
10	Controller	C	○

Bus initialization by the IFC statement does not affect the device-operating state (e.g. frequency settings, lamp on/off).

6.3 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

`WBYTE△&H3F,△&H14;`	Initializes all devices under the bus for message exchange (sending DCL)
`WBYTE△&HE3F,△&H04,△&H23;`	Initializes only the device whose address is 3 for message exchange (sending SDC)

■ Explanation

This statement executes initialization for message exchange by all devices or only the specified device on the GPIB of the specified select code.

■ Items to be initialized for message exchange

The MT8802A by which the DCL or SDC bus command is accepted executes the following:

1. Input buffer and Output Queue: Cleared; the MAV bit is also cleared at the same time.
2. Parser, Execution Controller, and Response Formatter: Reset
3. Device commands including *RST: Clears all commands that prevent these commands from executing.
4. Processing the *OPC command: Puts a device in OCIS (Operation Complete Command Idle State). As a result, the operation complete bit cannot be set in the Standard Event Status Register.
5. Processing the *OPC query: Puts a device in OQIS (Operation Complete Query Idle State). As a result, the operation complete bit 1 cannot be set in the Output Queue.
6. Device function: Puts sections relating to message exchange in an idle state. The device keeps waiting for a message from a controller.

Note: The items listed below are not affected even if DCL and SDC bus command processing is executed:

1. The current data set or stored in the device
2. Front panel settings
3. Other status byte state except MAV bit
4. Device operation in progress

6.4 Device Initialization by the *RST Command

■ Syntax

```
*RST
```

■ Example

`PRINT @1,"*RST"`: Initializes the device (MT8802A) whose address is 1 with level 3.

■ Explanation

The *RST(Reset) command is an IEEE488.2 common command which resets a device with level 3.

The *RST(Reset) command is used to reset a device (MT8802A) to a specific initial state. Refer to the separate Operation Manual Vol. 1 Appendix B for details of initialization items and initial values.

Note: The *RST command does not affect the items listed below.

1. IEEE488.1 interface state
2. Device address
3. Output Queue
4. Service Request Enable register
5. Standard Event Status Enable register
6. Power-on-status-clear flag setting
7. Calibration data affecting device specifications
8. Parameters preset for controlling external devices, etc.

6.5 Device Initialization by the PRE/INI/IP Command

■ Syntax

```
PRE
INI
IP
```

■ Example (program message)

`PRINT @1,"PRE"`: Initializes the device (MT8802A) whose address is 1 with level 3.

■ Explanation

The PRE, INI and IP commands are MT8802A device-dependent messages which initialize a device with level 3.

Refer to the separate Operation Manual Vol. 1 Appendix B for details of items initialized by the PRE, INI, and IP commands and initial values.

6.6 Device Status at Power-on

When the power is switched on:

1. Preset value: When a power-off time (POWERON LAST) is selected, the device is set to the status before the last power off.

   Preset value: When Recall memory No. (POWERON n) is selected, the device is set to file (number [n]) status.

2. The Input Buffer and Output Queue are cleared.
3. The Parser, Execution Controller, and Response Formatter are initialized.
4. The device is put into OCIS (Operation Complete Command Idle State).
5. The device is put into OQIS (Operation Complete Query Idle State).
6. The Standard Event Status and Standard Event Status Enable Registers are cleared. Events can be recorded after the registers have been cleared.

For the special case of "1.", when the power supply is first turned on after the device is shipped, the initial values are set to those in the initial setting table (refer to separate Operation Manual Vol. 1 Appendix B).

SECTION 7
SAMPLE PROGRAMS

This section gives some examples of the N88-BASIC programs that control the MT8802A from the NEC-PC9800 personal computer used as a controller.

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7.1 Precautions on Creating Programs

Note the following points when writing remote control programs.

No.	Precaution	Description
1	Be sure to initialize each device.	There may be a number of improper states in which each device is not actually used due to operation on its own panel or execution of other programs. It is necessary to use individual devices with the prescribed condition resulting from initializing them. Execute the following: ① Initializing the interface functions (ISET IFC) ② Initializing message exchange functions of each device (WBYTE &3F, &H14) ③ Initializing the functions proper to each device (PRE, INI, or *RST)
2	Set the device to the remote state of RWLS (Remote With Lockout State).	Set the device to the locally locked out state with WBYTE &H3F, &H11 to prevent it from returning to the local state. In a simple local state, pressing the [Local] key sets the device to the local state. Pressing a panel key at this moment causes the device's automatic measurement to function improperly, thus making unreliable measurement data likely. (Set every device to the locally controlled state with WBYTE &H3F,<listener>,[secondary address], &H01.)
3	Do not send any command (related to the device) other than the INPUT@ statement immediately after sending a query.	Write the INPUT@ statement in immediate succession to a query command. If MLA is received when a command other than the INPUT@ statement is sent to the controller before the response to a query is read, the output buffer is cleared, and the response message disappears.
4	Create a program that avoids exception processing of the protocol	The processing described in No.3 above is also exception processing of the protocol. Avoid exception processing if necessary. Avoid stoppage of execution (caused by an error) by providing a program with an exception-processing section against exceptions that can be foreseen.
5	Confirm the interface functions (subsets) of each device.	Be sure to confirm subsets of each device. Program execution does not advance if the necessary subset (s) has (have) not been prepared in the device. Also confirm that each device complies with IEEE488.2.

7.2 Sample Programs

7.2.1 Initializing the MT8802A

<Example 1.1> Initializes MT8802A

```
100 '-----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' INITIALIZE
130 '-----------------------------
140 ISET IFC'                          Initializes the interface function.
150 ISET REN'                          Sets remote enable to true.
160 CMD DELIM=0'                       Selects CR + LF as the delimiter.
170 LET RCA=1'                         Assigns MT8802A address to variable RCA.
180 PRINT @RCA;"INI"'                  Initializes MT8802A.
190 END
```

Separate volume 1, "Panel Operation Appendix B," describes the parameters initialized by the above program.
Line 140 initializes the GPIB interface functions (initializes only the GPIB interface).
Line 150 enables communications using the GPIB.
Line 180 initializes MT8802A functions including the measurement function.
There are four types of GPIB commands for initialization: IP, PRE, INI, and *RST. The usage of the 'IP' and 'PRE' commands are identical to the 'INI' command. The '*RST' command is used to execute initialization over a wider range. For the range of initialization levels, see SECTION 5.

Execute the INI and *RST commands in the following steps:

1) Initialize the device to be controlled (MT8802A) with the INI and *RST commands.
2) Use the program commands to set required functions.

This prevents the MT8802A from being controlled while unnecessary functions are set.

7.2.2 Measuring transmission

(1) Setting the TX measurement parameters

<Example 2.1> Sets the TX measurement parameters (carrier frequency, reference level, burst type, and Sync Word pattern) in the MT8802A.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' SET TX PARAMETERS
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 PRINT @RCA;"SYS PDC_CP"'          Selects the PDC Call Proc. system.
210 PRINT @RCA;"PNLMD SYSTEM"'        Switches to the System Setup screen.
220 PRINT @RCA;"RFINOUT MAIN"'        Uses the Main input-output connector.
230 PRINT @RCA;"PNLMD TESTER"'        Sets TX/RX tester as the measurement mode.
240 '
250 PRINT @RCA;"MEAS SETCOM"'         Switches to the Setup Common Parameter screen.
260 PRINT @RCA;"DUTCTRL NONE"'        Sets DUT Control to None.
270 PRINT @RCA;"MEASOBJ MSTCH"'       Sets MS-TCH as the signal to be measured.
280 PRINT @RCA;"FREQBAND 800MHZ_1"'   Specifies a frequency band of 800MHz-1.
290 PRINT @RCA;"CHAN 1"'              Sets the measurement frequency channel to 1CH.
300 PRINT @RCA;"RFLVL 10DBM"'         Sets the TX reference level to 10 dBm.
310 PRINT @RCA;"CHCARR FULL"'         Sets the Channels per carrier to full rate.
320 PRINT @RCA;"PATT S1"'             Sets the Sync word pattern to S1.
330 '
340 PRINT @RCA;"MEAS SETTX"'          Switches to the Setup TX Parameter screen.
350 PRINT @RCA;"MEASTRG SW"'          Specifies the synchronization word as the burst hunting trigger.
360 END
```

Lines 200 and 210 set TX measurement status for the PDC Call Processing system.
Set the TX measurement parameters on the Setup Common Parameter and Setup TX Parameter screens.
Lines 250 to 320 indicate settings on the Setup Common Parameter screen. Set the measurement frequency channel, and reference measurement level, etc. on these lines.
Line 340 and later lines indicate settings on the Setup TX Parameter screen. Set the parameters (burst hunting trigger, user calibration factor, etc.) of the RF signal to be measured on these lines.

Note: Handling the measurement system selection command

A long time may be required to execute measurement system selection on line 200. Then, all measurement parameters are initialized. If system selection is not needed especially, use a statement such as the REM statement to make the line a comment line as in the programs described below.

(2) Analyzing modulation and reading the analysis result

<Example 2.2> Executes modulation analysis and reads the result of a vector error measurement.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' MODULATION ANALYZE(1)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"MEASOBJ MSTCH"
280 PRINT @RCA;"FREQBAND 800MHZ_1"
290 PRINT @RCA;"CHAN 1"
300 PRINT @RCA;"RFLVL 34DBM"
310 PRINT @RCA;"CHCARR FULL"
320 PRINT @RCA;"PATT S1"
330 '
340 PRINT @RCA;"MEAS SETTX"
350 PRINT @RCA;"MEASTRG SW"
360 '
370 PRINT @RCA;"MEAS MODANAL"'          Switches to the modulation analysis screen.
380 PRINT @RCA;"STORAGE NRM"'           Sets normal mode.
390 PRINT @RCA;"SWP"'                   Starts the measurement.
400 '
410 PRINT @RCA;"VECTERR?"'              Queries the measured rms vector error value.
420 INPUT @RCA;VERR
430 PRINT @RCA;"PVECTERR?"'             Queries the measured peak vector error calue.
440 INPUT @RCA;PVERR
450 '
460 PRINT USING "RMS  vector error = ###.##% (rms)";VERR
470 PRINT USING "Peak vector error = ###.##%      ";PVERR
480 END
```

Lines 250 to 350 specify measurement conditions. Line 370 sets modulation analysis mode. Line 380 sets parameters (measurement mode) on the modulation analysis screen.

When line 390 is executed, the modulation analysis measurement starts. If the measurement mode is normal mode, acceptance of the next command stops until the measurement ends.

Lines 410 to 440 read a vector error (the RMS and maximum values) of the measurement result.

(3) Analyzing modulation and reading the analysis result (reading analysis data row in ASCII format)

<Example 2.3> Executes the modulation analysis and reads the vector error data row of each symbol.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' MODULATION ANALYZE(2: ASCII READ)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 LET NUM=110'                          Specifies the number of data items to beread.
190 DIM TRACE(NUM)'                       Declares the data storage array.
200 PRINT @RCA;"INI"
210 '
220 REM PRINT @RCA;"SYS PDC_CP"
230 PRINT @RCA;"PNLMD SYSTEM"
240 PRINT @RCA;"RFINOUT MAIN"
250 PRINT @RCA;"PNLMD TESTER"
260 '
270 PRINT @RCA;"MEAS SETCOM"
280 PRINT @RCA;"DUTCTRL NONE"
290 PRINT @RCA;"MEASOBJ MSTCH"
300 PRINT @RCA;"FREQBAND 800MHZ_1"
310 PRINT @RCA;"CHAN 1"
320 PRINT @RCA;"RFLVL 34DBM"
330 PRINT @RCA;"CHCARR FULL"
340 PRINT @RCA;"PATT S1"
350 '
360 PRINT @RCA;"MEAS SETTX"
370 PRINT @RCA;"MEASTRG SW"
380 '
390 PRINT @RCA;"MEAS WAVEFORM"'           Switches to the waveform display screen.
400 PRINT @RCA;"TRFORM VECT"'             Switches to the vector error screen.
410 PRINT @RCA;"STORAGE NRM"
420 PRINT @RCA;"BIN 0"'                   Converts the ASCII format to a value.
430 PRINT @RCA;"SWP"'                     Starts the measurement.
440 '
450 FOR I=0 TO NUM
460 PRINT @RCA;"XMV? "+STR$(I)+",1"'      Queries the measured vector error value.
470 INPUT @RCA;VERR$
480 LET TRACE(I)=VAL(VERR$)'              Converts ASCII format to numeric format.
490 NEXT I
500 '
510 FOR I=0 TO NUM
520 PRINT USING "RMS Vector Error at ###.##symbol = ####.###%";I, TRACE(I)/100
530 NEXT I
540 END
```

Line 390 to 400 sets the modulation analysis measurement mode (waveform display mode). Line 410 sets the measurement mode (normal mode).

Line 420 specifies ASCII format as the measurement result format.

Lines 450 to 490 read measurement data and stores it in array TRACE. Because the read data is ASCII format data, it is converted to a real number with function VAL 0.

(4) Analyzing the modulation and reading the analysis result (reading analysis data row in the binary format)

<Example 2.4> Executes modulation analysis and reads the vector error data row of each symbol in binary format.

```
100 '-----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' MODULATION ANALYZE(3: BINARY READ)
130 '-----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 LET NUM=110
190 DIM TRACE(NUM)
200 PRINT @RCA;"INI"
210 '
220 REM PRINT @RCA;"SYS PDC_CP"
230 PRINT @RCA;"PNLMD SYSTEM"
240 PRINT @RCA;"RFINOUT MAIN"
250 PRINT @RCA;"PNLMD TESTER"
260 '
270 PRINT @RCA;"MEAS SETCOM"
280 PRINT @RCA;"DUTCTRL NONE"
290 PRINT @RCA;"MEASOBJ MSTCH"
300 PRINT @RCA;"FREQBAND 800MHZ_1"
310 PRINT @RCA;"CHAN 1"
320 PRINT @RCA;"RFLVL 34DBM"
330 PRINT @RCA;"CHCARR FULL"
340 PRINT @RCA;"PATT S1"
350 '
360 PRINT @RCA;"MEAS SETTX"
370 PRINT @RCA;"MEASTRG SW"
380 '
390 PRINT @RCA;"MEAS WAVEFORM"'          Switches to the waveform display screen.
400 PRINT @RCA;"TRFORM VECT"'            Switches to the vector error screen.
410 PRINT @RCA;"STORAGE NRM"
420 PRINT @RCA;"BIN 1"'                  Specifies binary format as the read data format.
430 PRINT @RCA;"TRM 1"'                  Selects CR+LF as a delimiter.
440 PRINT @RCA;"SWP"'                    Starts measurement.
450 '
460 PRINT @RCA;"XMV? 0,"+STR$(NUM+1)'    Queries the measured vector error value.
470 WBYTE &H3F,&H5F,&H20,&H41;'          Specifies the controller as a listener and MT8802A as a talker.
480 FOR I=0 TO NUM
490 RBYTE ;UPRBYTE, LWRBYTE'             Receives data in 2-byte units.
500 TRACE(I)=UPRBYTE*256+LWRBYTE'        Converts the data to decimal numbers.
510 IF UPRBYTE>=128 THEN TRACE(I)=TRACE(I)-65536!'    Corrects negative values.
520 NEXT I
530 '
540 RBYTE ;DMY1, DMY2'                   Receives dummy data.
550 WBYTE &H3F,&H5F;'                    Releases the talker and listener.
560 '
570 FOR I=0 TO NUM
580 PRINT USING "RMS Vector Error at ###.##symbol = ####.###%";I, TRACE(I)/100
590 NEXT I
600 END
```

"BINΔ1" on line 420 specifies binary format as the data format.
The terminator indicating completion of the last data byte transmission is set to CR + LF at line 430. The data query on line 440 is made after measurement is executed once on line 460.
On line 470, the controller (address 0) is specified as a listener, and the MT8802A (address 1) is specified as a talker. On line 490, 2-byte data is read by the controller. On line 500, 2-byte binary data is converted into decimal to variable TRACE (1). Line 510 allows data to be correctly read even if the data is negative. Statements from the FOR statement to the NEXT statement on lines 480 to 520 are executed repeatedly for each data item read.
On line 540, the terminator transferred immediately after completion of the last data byte transmission is assigned to dummy variables DMY1 and DMY2. This prevents the CR + LF (LF for TRM 0) terminators from being assigned elsewhere. Although two variables (DMY1 and DMY2) are used here, only one is used when LF is the terminator.
Line 550 is used to release the talker and listener.

[Interface message (line 470)]

```
WBYTE   &H3F,   &H5F,   &H20,   &H41 ;
          └──┘    └──┘    └──┘    └──┘
          UNL     UNT     MLA     MTA
```

UNL=Unlisten : Specifies all devices so that listener status can be released.

UNT=Untalk : Specifies all devices so that talker status can be released.

MLA=My Listen Address : When a device receives the listener address code (listener address command - MLA) corresponding to the address (address number) specified for the device (device and controller), it becomes a listener.

The &H20 listener address code specifies a device with address number 0 as a listener.

MTA=My Talk Address : When a device receives the talker address code (talker address command - MTA) corresponding to the address (address number) specified for the device (device and controller), it becomes a talker.

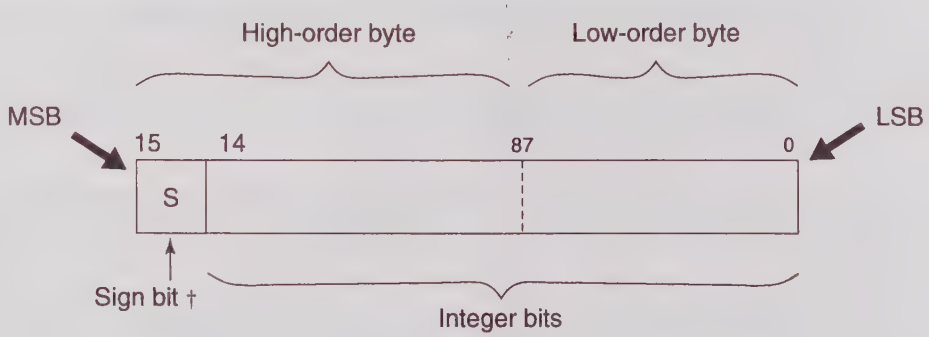
The &H41 talker address code specifies a device with address number 1 as a talker.

[Transferring 2-byte binary data]

Two-byte binary data can lie in the range of the 65,536 integers from -32,768 to 32,767 as shown below, and each is sent out in sequence from the high-order byte to the low-order byte.

16-Bit Binary	With Sign	No Sign
1000000000000000	–32768	32768
1000000000000001	–32767	32769
1000000000000010	–32766	32770
1111111111111101	–3	65533
1111111111111110	–2	65534
1111111111111111	–1	65535
0000000000000000	0	0
0000000000000001	1	1
0000000000000010	2	2
0000000000000011	3	3
0111111111111101	32765	32765
0111111111111110	32766	32766
0111111111111111	32767	32767

The 16-bit (2-byte) binary data consists of a sign bit and integer bits.
Sign bit : Bit 15 (MSB) is used.
Integer bits : Bits 0 to 14 are used.

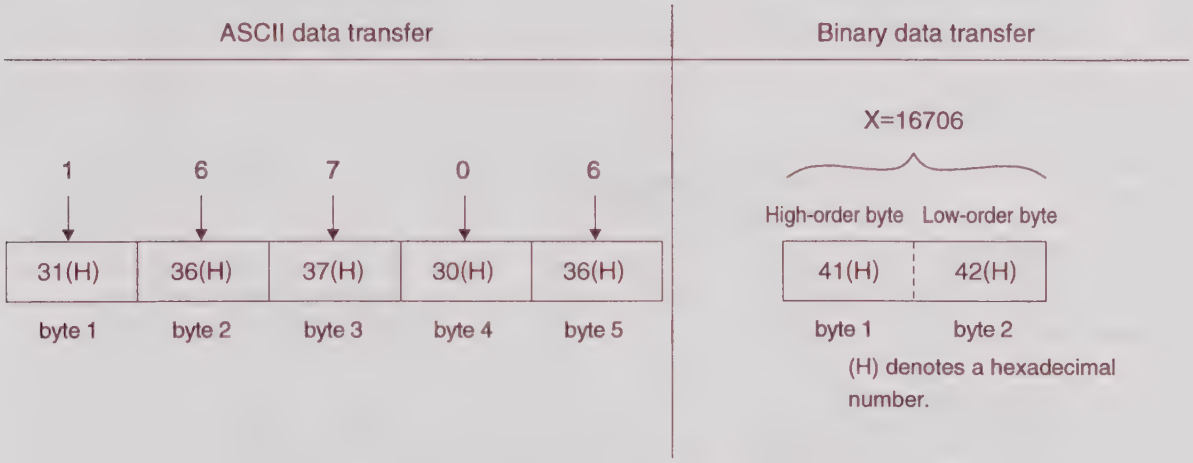


Internal Expression of 2-byte Binary Data

†When a negative integer is stored in a numeric variable, its MSB is set to 1 to indicate that it is negative. The negative value is also stored in a numeric variable as two's-complement.

The transfer of integer 16706 as ASCII data and as binary data is compared below.

Five bytes are necessary for the ASCII data transfer. The ASCII code must be converted to binary code. Conversely, only two bytes are necessary for binary data transfer and no data format conversion is required. Thus, the latter is often used for high speed transfer.



$16706\ (D)=4\times16^3+1\times16^2+4\times16^1+2\times16^0$

Binary notation

	High-order byte								Low-order byte							
bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
X=16706	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0

(Transfer sequence) First byte -> Second byte

bit	7	6	5	4	3	2	1	0	
First byte	0	1	0	0	0	0	0	1	(High-order byte) = 41 (H)
Second byte	0	1	0	0	0	0	1	0	(Low-order byte) = 42 (H)

(5) Measuring the RF power (average power measurement)

<Example 2.5> Measures the RF power and reads the average power.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' RF POWER MEASURE(1)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 SRQ ON'                                  Permits use of SRQ.
200 '
210 REM PRINT @RCA;"SYS PDC_CP"
220 PRINT @RCA;"PNLMD SYSTEM"
230 PRINT @RCA;"RFINOUT MAIN"
240 PRINT @RCA;"PNLMD TESTER"
250 '
260 PRINT @RCA;"MEAS SETCOM"
270 PRINT @RCA;"DUTCTRL NONE"
280 PRINT @RCA;"MEASOBJ MSTCH"
290 PRINT @RCA;"FREQBAND 800MHZ_1"
300 PRINT @RCA;"CHAN 1"
310 PRINT @RCA;"RFLVL 34DBM"
320 PRINT @RCA;"CHCARR FULL"
330 PRINT @RCA;"PATT S1"
340 '
350 PRINT @RCA;"MEAS SETTX"
360 PRINT @RCA;"MEASTRG SW"
370 '
380 PRINT @RCA;"MEAS RFPWR"'                 Switches to the RF power measurement screen.
390 PRINT @RCA;"WINDOW SLOT"'                Displays a waveform in slot mode.
400 PRINT @RCA;"UNIT DBM"'                   Sets the measurement unit to dBm.
410 PRINT @RCA;"*CLS"'                       Clears the GPIB status.
420 PRINT @RCA;"ADJRNG"'                     Optimizes the power measurement range.
430 *LOOP1
440 FOR I=0 TO 1000: NEXT I
450 PRINT @RCA;"ESR2?"'                      Check the optimization completed state.
460 INPUT @RCA;STAT
470 IF (STAT AND 2) <> 2 THEN GOTO *LOOP1
480 '
490 PRINT @RCA;"STORAGE NRM"
500 PRINT @RCA;"SWP"'                        Starts the measurement.
510 '
520 PRINT @RCA;"TXPWR?"'                     Queries the measured RF Power value.
530 INPUT @RCA;POW
540 PRINT USING "Average RF Power = ###.##dBm";POW
550 END
```

Line 380sets RF power measurement mode. Line 390 displays the MT8802A in slot mode. Line 400sets the measurement unit to dBm.

Lines 420 to 470 execute range optimization for high accuracy measurement of the RF power. Because range optimization may take a long time, processing loops to monitor MT8802A operation. Set the repetition count of the FOR-to-NEXT loop of line 440 so that the GPIB-control wait time of the controller becomes about 50 ms.

Line 500 starts the measurement. Lines 520 to 530 read the measurement result.

(6) Measuring the RF power (measuring the marker point power)

<Example 2.6> Measures the RF power and reads the power at the specified marker point.

```
100 '---------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' RF POWER MEASURE(2)
130 '---------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 LET PMAK=10'                          Specified position of marker point.
200 SRQ ON'                               Permits use of SRQ.
210 '
220 REM PRINT @RCA;"SYS PDC_CP"
230 PRINT @RCA;"PNLMD SYSTEM"
240 PRINT @RCA;"RFINOUT MAIN"
250 PRINT @RCA;"PNLMD TESTER"
260 '
270 PRINT @RCA;"MEAS SETCOM"
280 PRINT @RCA;"DUTCTRL NONE"
290 PRINT @RCA;"MEASOBJ MSTCH"
300 PRINT @RCA;"FREQBAND 800MHZ_1"
310 PRINT @RCA;"CHAN 1"
320 PRINT @RCA;"RFLVL 34DBM"
330 PRINT @RCA;"CHCARR FULL"
340 PRINT @RCA;"PATT S1"
350 '
360 PRINT @RCA;"MEAS SETTX"
370 PRINT @RCA;"MEASTRG SW"
380 '
390 PRINT @RCA;"MEAS RFPWR"
400 PRINT @RCA;"WINDOW SLOT"
410 PRINT @RCA;"MKR NRM"'                 Displays a normal marker.
420 PRINT @RCA;"UNIT DBM"
430 PRINT @RCA;"*CLS"
440 PRINT @RCA;"ADJRNG"
450 *LOOP1
460 FOR I=0 TO 1000: NEXT I
470 PRINT @RCA;"ESR2?"
480 INPUT @RCA;STAT
490 IF (STAT AND 2) <> 2 THEN GOTO *LOOP1
500 '
510 PRINT @RCA;"STORAGE NRM"
520 PRINT @RCA;"SWP"
530 '
540 PRINT @RCA;"MKRS "+STR$(PMAK)'        Specifies a marker point.
550 PRINT @RCA;"MKL?"'                    Queries the measurement level of the marker point.
560 INPUT @RCA;POW
570 PRINT USING "RF Power at marker = ###.##dBm";POW
580 END
```

Line 410 displays a marker. Specify a marker point on line 540. The marker point is the PMAK point specified on line 190 (symbol 10).

Lines 550 and 560 read the data at the marker point.

(7) Measuring the RF power (reading the measurement data row)

<Example 2.6> Measures the RF power and reads and displays the measurement data row.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' RF POWER MEASURE(3)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 LET NUM=2200'                          Specifies the number of data items to be read.
190 DIM TRACE(NUM)'                        Declares the read data storage array.
200 PRINT @RCA;"INI"
210 SRQ ON'                                Permits use of SRQ.
220 '
230 REM PRINT @RCA;"SYS PDC_CP"
240 PRINT @RCA;"PNLMD SYSTEM"
250 PRINT @RCA;"RFINOUT MAIN"
260 PRINT @RCA;"PNLMD TESTER"
270 '
280 PRINT @RCA;"MEAS SETCOM"
290 PRINT @RCA;"DUTCTRL NONE"
300 PRINT @RCA;"FREQBAND 800MHZ_1"
310 PRINT @RCA;"CHAN 1"
320 PRINT @RCA;"RFLVL 20DBM"
330 PRINT @RCA;"MEASOBJ MSTCH"
340 PRINT @RCA;"CHCARR FULL"
350 PRINT @RCA;"PATT S1"
360 '
370 PRINT @RCA;"MEAS SETTX"
380 PRINT @RCA;"MEASTRG SW"
390 '
400 PRINT @RCA;"MEAS RFPWR"
410 PRINT @RCA;"WINDOW SLOT"
420 PRINT @RCA;"UNIT DBM"
430 PRINT @RCA;"BIN 0"'                    Outputs the measurement result in ASCII format.
440 PRINT @RCA;"*CLS"
450 PRINT @RCA;"ADJRNG"
460 *LOOP1
470 FOR I=0 TO 1000: NEXT I
480 PRINT @RCA;"ESR2?"'                    Checks the optimization completed state.
490 INPUT @RCA;STAT
500 IF (STAT AND 1) <> 1 THEN GOTO *LOOP1
510 '
520 PRINT @RCA;"STORAGE NRM"
530 PRINT @RCA;"SWP"'                      Starts measurement.
540 '
550 FOR I=0 TO NUM
560 PRINT @RCA;"XMD? "+STR$(I)+",1"'       Queries the RF Power measurement results.
570 INPUT @RCA;RFPOW$
580 LET TRACE(I)=VAL(RFPOW$)'              Converts the read data to numeric data.
590 NEXT I
600 '
610 FOR I=0 TO NUM
620 PRINT USING "RF Power at ###.##symbol = ####.##dBm";I/10-100, TRACE(I)/100
630 NEXT I
640 END
```

Line 430 converts the format of the read measurement result to ASCII format.

Lines 550 to 590 read the measurement result. Lines 610 to 630 display the result on the controller.

(8) Measuring the RF power (setting the template)

<Example 2.7> Sets the template for RF power measurement.

```
100 '---------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' RF POWER(4) SET TEMPLATE
130 '---------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD TESTER"
220 '
230 PRINT @RCA;"MEAS SETCOM"
240 PRINT @RCA;"MEASOBJ MSTCH"
250 '
260 PRINT @RCA;"MEAS SETTEMP"'          Switches to the RF power template setting screen.
270 PRINT @RCA;"OFFLVL DBM"'            Sets the reference level 1 unit of burst Off to dBm.
280 PRINT @RCA;"TEMPLVL 1, -56"'        Sets the reference level 1 value to -56 dBm.
290 PRINT @RCA;"TEMPLVL 2,   4"'        Sets the reference level 2 value to  4 dBm.
300 PRINT @RCA;"TEMPLVL 3, -14"'        Sets the reference level 3 value to -14 dBm.
310 PRINT @RCA;"TEMPLVL 4, -60"'        Sets the reference level 4 value to -60 dBm.
320 PRINT @RCA;"TEMPLVL 5, -14"'        Sets the reference level 5 value to -14 dBm.
330 END
```

Line 260 switches the RF power template setting screen.

Set a template (level) on lines 270 to 320.

(9) Power meter (measuring the average power)

<Example 2.8> Measures the average RF power using the power meter.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' POWER METER
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"FREQBAND 800MHZ_1"
280 PRINT @RCA;"CHAN 1"
290 PRINT @RCA;"RFLVL 40DBM"
300 '
310 PRINT @RCA;"MEAS PWRMTR"'          Switches to the power meter measurement screen.
320 PRINT @RCA;"*CLS"
330 PRINT @RCA;"ADJRNG"'               Optimizes the power measurement range.
340 *LOOP1
350 FOR I=0 TO 1000: NEXT I
360 PRINT @RCA;"ESR2?"'                Checks the optimization completed state.
370 INPUT @RCA;STAT
380 IF (STAT AND 2) <> 2 THEN GOTO *LOOP1
390 '
400 PRINT @RCA;"SWP"'                  Starts the measurement.
410 '
420 PRINT @RCA;"POWER? DBM"'           Queries the power measurement result.
430 INPUT @RCA;POW'
440 PRINT USING "RF Power = ###.##dBm";POW
450 END
```

Line 310 sets the power meter measurement mode. Lines 320 to 380 set the optimum range. Because the optimum range setting may take a long time, the MT8802A operation state is monitored.
Lines 420 to 430 read the average power.

(10) Power meter (calibrating the zero point)

<Example 2.10> Calibrates the zero point of the power meter.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' POWER METER (ZERO SET)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 SRQ ON'                                  Permits use of SRQ
200 '
210 REM PRINT @RCA;"SYS PDC_CP"
220 PRINT @RCA;"PNLMD SYSTEM"
230 PRINT @RCA;"RFINOUT MAIN"
240 PRINT @RCA;"PNLMD TESTER"
250 '
260 PRINT @RCA;"MEAS SETCOM"
270 PRINT @RCA;"DUTCTRL NONE"
280 PRINT @RCA;"FREQBAND 800MHZ_1"
290 PRINT @RCA;"CHAN 1"
300 '
310 PRINT @RCA;"MEAS PWRMTR"'                Switches to the power meter measurement screen.
320 PRINT @RCA;"RNG2"'                       Minimizes the power measurement range.
330 '
340 PRINT @RCA;"*CLS"
350 PRINT @RCA;"ZEROSET"'                    Starts the zero-point adjustment.
360 *LOOP1
370 FOR I=0 TO 1000: NEXT I
380 PRINT @RCA;"ESR2?"
390 INPUT @RCA;STAT
400 IF (STAT AND 2) <> 2 THEN GOTO *LOOP1
410 '
420 PRINT "End of zero set for RF Power."
430 END
```

Line 310 switches to the power meter measurement screen.

Line 320 minimizes the measurement range. Be sure to calibrate the zero point without signal input and at the lowest level.

Line 350 starts zero point calibration of the power meter. Because zero calibration takes a long time, MT8802A operation is monitored at lines 360 to 400.

(11) Measuring the occupied frequency bandwidth

<Example 2.11> Measures the occupied frequency bandwidth.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' OCC. BW
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"MEASOBJ MSTCH"
280 PRINT @RCA;"FREQBAND 800MHZ_1"
290 PRINT @RCA;"CHAN 1"
300 PRINT @RCA;"RFLVL 20DBM"
310 PRINT @RCA;"CHCARR FULL"
320 PRINT @RCA;"PATT S1"
330 '
340 PRINT @RCA;"MEAS SETTX"
350 PRINT @RCA;"MEASTRG SW"
360 '
370 PRINT @RCA;"MEAS OBW,HIGH"'      Switches to the occupied frequency bandwidth measurement
                                     (High Speed) screen.
380 PRINT @RCA;"STORAGE AVG"'        Sets the measurement mode to storage mode.
390 PRINT @RCA;"AVR 3"'              Specifies the average count to 3.
400 PRINT @RCA;"*CLS"
410 PRINT @RCA;"ADJRNG"'             Optimizes the measurement range.
420 '
430 ENDSTS = 0
440 WHILE (ENDSTS AND 2)<> 2
450 FOR I=0 TO 1000: NEXT I
460 PRINT @RCA;"ESR2?"'              Checks the optimization completed state.
470 INPUT @RCA;ENDSTS
480 WEND
490 '
500 PRINT @RCA;"*CLS"
510 PRINT @RCA;"SWP"                 Starts the measurement.
520 '
530 ENDSTS = 0
540 WHILE (ENDSTS AND 16)<> 16
550 FOR I=0 TO 1000: NEXT I
560 PRINT @RCA;"ESR2?"'              Checks the optimization completed state.
570 INPUT @RCA;ENDSTS
580 WEND
590 '
600 PRINT @RCA;"OCCBW?"'             Queries the occupied frequency bandwidth measurement result.
610 INPUT @RCA;OCCBW
620 PRINT USING "Occupied Bandwidth = ###.##kHz";OCCBW/1000
630 END
```

Line 370 sets occupied frequency bandwidth measurement (high speed measurement) mode.
Lines 380 and 390 specifies to average the measured value.
Lines 400 to 480 optimize the level to reduce the measurement error.
Line 570 starts the measurement. In this measurement, the END status is monitored and the completion of measurement is waited for at lines 530 to 580.
Lines 600 to 620 read the measurement result and display it on the controller.

(12) Measuring the adjacent channel leakage power

<Example 2.12> Measures the adjacent channel leakage power.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' ADJ. CH
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"MEASOBJ MSTCH"
280 PRINT @RCA;"FREQBAND 800MHZ_1"
290 PRINT @RCA;"CHAN 1"
300 PRINT @RCA;"RFLVL 30DBM"
310 PRINT @RCA;"CHCARR FULL"
320 PRINT @RCA;"PATT S1"
330 '
340 PRINT @RCA;"MEAS SETTX"
350 PRINT @RCA;"MEASTRG SW"
360 '
370 PRINT @RCA;"MEAS ADJ,HIGH"'
```

Switches to the adjacent channel leakage power measurement (High speed) screen.

```
380 PRINT @RCA;"STORAGE NRM"
390 PRINT @RCA;"*CLS"
400 PRINT @RCA;"ADJRNG"
410 '
420 ENDSTS = 0
430 WHILE (ENDSTS AND 2) <> 2
440 FOR I=0 TO 1000: NEXT I
450 PRINT @RCA;"ESR2?"'
460 INPUT @RCA;ENDSTS
470 WEND
480 '
490 PRINT @RCA;"SWP"'
500 '
510 PRINT @RCA;"ADJCH? LOW2,DBM"'
```

Checks the measurement completed state.

Starts the measurement.

Queries the result of measuring the next lower adjacent channel leakage power.

```
520 INPUT @RCA;LOW2
530 PRINT @RCA;"ADJCH? LOW1,DBM"'
```

Queries the result of measuring the lower adjacent channel leakage power.

```
540 INPUT @RCA;LOW1
550 PRINT @RCA;"ADJCH? UP1,DBM"'
```

Queries the result of measuring the upper adjacent channel leakage power.

```
560 INPUT @RCA;UP1
```

```
570 PRINT @RCA;"ADJCH? UP2,DBM"'
580 INPUT @RCA;UP2
590 '
600 PRINT "Adjacent channel power"
610 PRINT USING "       Mean power (-100kHz) = ###.## dBm";LOW2
620 PRINT USING "                  (- 50kHz) = ###.## dBm";LOW1
630 PRINT USING "                  (  50kHz) = ###.## dBm";UP1
640 PRINT USING "                  ( 100kHz) = ###.## dBm";UP2
650 END
```

Queries the result of measuring the upper next adjacent channel leakage power.

Line 370 sets the adjacent channel leakage power measurement (high speed measurement) mode.

Lines 390 to 470 optimize the level to reduce the measurement error.

Line 490 starts the measurement.

Lines 510 to 580 read the measurement result. Line 600 to 640 display this result on the controller.

7.2.3 Measuring reception

(1) Setting the RX measurement parameters

<Example 3.1> Sets RX measurement parameters (e.g., measurement signals, BER input interface,) in the MT8802A.

```
100 '-----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' SET RX PARAMETERS
130 '-----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"MEASOBJ MSTCH"
280 PRINT @RCA;"RFREQ 500MHZ"'          Sets the RX measurement frequency to 500 MHz.
290 PRINT @RCA;"OLVL -30DBM"'           Sets the RX measurement level to -30 dBm.
300 PRINT @RCA;"CHCARR FULL"
310 PRINT @RCA;"SLTNUM 0"
320 PRINT @RCA;"TCH PN9"
330 PRINT @RCA;"SCBL ON"
340 PRINT @RCA;"SCBLC FF"
350 '
360 PRINT @RCA;"MEAS SETRX"'            Switches to the Setup RX Parameter screen.
370 PRINT @RCA;"FRMSTRCT FRAME"'        Sets the frame structure to feame.
380 PRINT @RCA;"DPE NORM"'              Sets the differential phase encode to normal.
390 END
```

Lines 200 and 230 set RX measurement state for the PDC system.

Lines 210 and 220 set the RF signal output terminal.

Set RX measurement parameters on the Setup Common Parameter and Setup RX Parameter screens.

Lines 250 to 340 indicate the settings on the Setup Common parameter screen. Here, the test signal center frequency, test signal output level, and measured signal are set.

Line 360 and later lines indicate settings on the Setup RX Parameter screen. Here, the parameters (e.g., burst type, BER input interface) of the RF signal to be measured are set.

(2) Setting the test send signals

<Example 3.2> Sets send signal parameters for RX measurement in the MT8802A and instructs the instrument to transmit the test signal.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' SET π/4 DQPSK MODULATION
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"MEASOBJ MSTCH"
280 PRINT @RCA;"CHCARR FULL"
290 PRINT @RCA;"SLTNUM 0"
300 PRINT @RCA;"TCH PN9"
310 PRINT @RCA;"SCBL ON"
320 PRINT @RCA;"SCBLC FF"
330 '
340 PRINT @RCA;"MEAS SETRX"
350 PRINT @RCA;"FRMSTRCT FRAME"
360 PRINT @RCA;"DPE NORM"
370 '
380 PRINT @RCA;"MEAS BER"'          ' Switches to the BER measurement screen.
390 PRINT @RCA;"RFREQ 500MHZ"'      ' Sets the RX measurement frequency to 500 MHz.
400 PRINT @RCA;"OLVL -30DBM"'       ' Sets the RX measurement signal level to -30 dBm.
410 PRINT @RCA;"LVL ON"'            ' Outputs the RX measurement signal.
420 PRINT @RCA;"MOD ON"'            ' Modulates the RX measurement signal.
430 END
```

Lines 250 to 360 specify conditions of the test send signals.

Line 380 sets BER measurement mode. Test send signals can be output in BER measurement screen.

Lines 390 and 400 set the transmission frequency and output level. These items can also be set on the Setup Common Parameter screen.

Line 410 outputs non-modulated signals. Line 420 sets modulation on to output signals for the test.

(3) BER measurement 1: BER measurement at the specified level

<Example 3.3> Performs BER measurement using test signals of the specified level.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' BIT ERROR RATE MEASURE (1)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 LET SGLVL=-30!'                          Sets the RX measurement signal output level to -30 dBm.
190 PRINT @RCA;"INI"
200 SRQ ON'                                  Enables reading of SRQ.
210 '
220 REM PRINT @RCA;"SYS PDC_CP"
230 PRINT @RCA;"PNLMD SYSTEM"
240 PRINT @RCA;"RFINOUT MAIN"
250 PRINT @RCA;"PNLMD TESTER"
260 '
270 PRINT @RCA;"MEAS SETCOM"
280 PRINT @RCA;"DUTCTRL NONE"
290 PRINT @RCA;"MEASOBJ MSTCH"
300 PRINT @RCA;"SLTNUM 0"
310 PRINT @RCA;"TCH PN9"
320 PRINT @RCA;"SCBL ON"
330 PRINT @RCA;"SCBLC FF"
340 '
350 PRINT @RCA;"MEAS SETRX"
360 PRINT @RCA;"FRMSTRCT FRAME"
370 PRINT @RCA;"DPE NORM"
380 '
390 PRINT @RCA;"MEAS BER"'                   Switches to the BER measurement screen.
400 PRINT @RCA;"RFREQ 500MHZ"
410 PRINT @RCA;"OLVL "+STR$(SGLVL)+"DBM"'    Sets the RX test signal level.
420 PRINT @RCA;"LVL ON"
430 PRINT @RCA;"MOD ON"
440 '
450 PRINT @RCA;"*CLS"
460 PRINT @RCA;"CNTTM 4"'                    Sets the number of BER measurement data items (10^4 bits).
470 PRINT @RCA;"BERSA"'                      Starts the BER measurement.
480 '
490 *LOOP1'                                  Waits for completion of BER measurement.
500 FOR I=0 TO 1000: NEXT I
510 PRINT @RCA;"ESR2?"
520 INPUT @RCA;N
530 IF (N AND 1)<> 1 THEN GOTO *LOOP1
540 '
550 PRINT @RCA;"BERRATE?"'                   Reads the measured BER value.
560 INPUT @RCA;BER$
570 PRINT USING "RX level ###.#dBm : Bit Error Rate = @";SGLVL,BER$
580 '
590 END
```

Lines 390 to 430 output the test signals.
Line 460 sets the measurement unit of the BER measurement data to 10,000 bits. Line 470 starts the BER measurement.
Lines 490 to 530 wait for completion of BER measurement. Because the contents of the ESR2 status register are checked, line 450 clears the ESR2 register.
Lines 550 to 570 read the BER measurement result and display it on the controller.

(4) BER measurement 2: BER measurement from which the specified error rate is obtained

<Example 3.4> Performs BER measurement in which a test signal level to be a specified error rate is obtained.

```
100 '----------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' BIT ERROR RATE MEASURE (2)
130 '----------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 LET BERLINIT=.01'                    Sets the specified error rate.
190 LET SGLVL1=-50'                      Sets the measurement start level to -50 dBm.
200 LET SGLVL2=-70'                      Sets the measurement complete level to -70 dBm.
210 PRINT @RCA;"INI"
220 SRQ ON'                              Enables reading of SRQ.
230 '
240 REM PRINT @RCA;"SYS PDC_CP"
250 PRINT @RCA;"PNLMD SYSTEM"
260 PRINT @RCA;"RFINOUT MAIN"
270 PRINT @RCA;"PNLMD TESTER"
280 '
290 PRINT @RCA;"MEAS SETCOM"
300 PRINT @RCA;"DUTCTRL NONE"
310 PRINT @RCA;"MEASOBJ MSTCH"
320 PRINT @RCA;"SLTNUM 0"
330 PRINT @RCA;"TCH PN9"
340 PRINT @RCA;"SCBL ON"
350 PRINT @RCA;"SCBLC FF"
360 '
370 PRINT @RCA;"MEAS SETRX"
380 PRINT @RCA;"FRMSTRCT FRAME"
390 PRINT @RCA;"DPE NORM"
400 '
410 PRINT @RCA;"MEAS BER"
420 PRINT @RCA;"RFREQ 500MHZ"
430 PRINT @RCA;"OLVL "+STR$(SGLVL1)+"DBM"
440 PRINT @RCA;"LVL ON"
450 PRINT @RCA;"MOD ON"
460 PRINT @RCA;"CNTTM 4"
470 '
480 *LOOP0
490 PRINT @RCA;"OLVL "+STR$(SGLVL1)+"DBM"'     Sets the RX test signal level.
500 PRINT @RCA;"*CLS"'                         Clears ESR status.
510 PRINT @RCA;"BERSA"'                        Starts the measurement.
520 '
530 *LOOP1'                                    Waits for completion of BER measurement.
540 FOR I=0 TO 1000: NEXT I
550 PRINT @RCA;"ESR2?"
560 INPUT @RCA;N
570 IF (N AND 1) <> 1 THEN GOTO *LOOP1
580 '
```

```
590 PRINT @RCA;"BERRATE?"'              Reads the measured BER value.
600 INPUT @RCA;BER$
610 PRINT USING "RX level ###.#dBm : Bit Error Rate = @";SGLVL,BER$
620 '
630 IF BERERR > VAL(BER$) THEN *LEND
640 SGLVL1 = SGLVL1-.1'                 Lowers the test signal level by 0.1 dB.
650 IF SGLVL1>=SGLVL2    THEN *LOOP0
660 '
670 *LEND
680 END
```

Set fixed parameters used for BER measurement on lines up to line 460.

Lines 480 to 650 measure BER while lowering the measurement signal level to the specified value. Line 490 sets the measurement level of variable SGLVL1. Lines 500 to 610 obtain the BER value at the set specified level.

Line 630 interrupts the measurement if the BER measurement result exceeds the specified error rate. The test signal level measured last or the level succeeding this signal level is the required specified level.

Line 640 lowers the test signal level in 0.1 dB units. When the test signal level reaches the final measured level of variable SGLVL2 on line 650, the measurement is completed.

7.2.4 Automatic Measurement

This paragraph gives examples of programs that use the TX automatic all-item measurement function provided in the MT8802A.

(1) Setting TX automatic measurement items

<Example 4.1> Sets TX automatic measurement items.

```
100 '-------------------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' SELECT TX ALL MEASURE ITEM
130 '-------------------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 PRINT @RCA;"INI"
190 '
200 REM PRINT @RCA;"SYS PDC_CP"
210 PRINT @RCA;"PNLMD SYSTEM"
220 PRINT @RCA;"RFINOUT MAIN"
230 PRINT @RCA;"PNLMD TESTER"
240 '
250 PRINT @RCA;"MEAS SETCOM"
260 PRINT @RCA;"DUTCTRL NONE"
270 PRINT @RCA;"MEASOBJ MSTCH"
280 PRINT @RCA;"FREQBAND 800MHZ_1"
290 PRINT @RCA;"CHAN 1"
300 PRINT @RCA;"RFLVL 30DBM"
310 PRINT @RCA;"CHCARR FULL"
320 PRINT @RCA;"PATT S1"
330 '
340 PRINT @RCA;"MEAS TXITEM"'          Switches to the TX automatic measurement item setting screen.
350 PRINT @RCA;"AITEM STD"'            Sets the STANDARD measurement parameters.
360 PRINT @RCA;"MORGNOFS ON"'          Adds Origin Offset measurement to the measurement items.
370 PRINT @RCA;"JORGNOFS ON"'          Judges the Origin Offset measurement result.
380 PRINT @RCA;"ULORGNOFS -30.0DB"'    Sets the highest judged value of Origin Offset to -30.0 dB.
390 '
400 END
```

Line 340 switches to the Select All Measure Item screen. For the TX automatic measurement item setting of this program, required measurement item "Origin Offset" is added to default parameter "Standard" of the MT8802A.

(2) TX automatic measurement

<Example 4.2> Set the TX automatic measurement items and the automatic measurement based on the set items.

```
100 '-------------------------------------
110 ' MT8802A GPIB SAMPLE PROGRAM
120 ' TX ALL MEASURE
130 '-------------------------------------
140 ISET IFC
150 ISET REN
160 CMD DELIM=0
170 LET RCA=1
180 DIM JDATA(10), RVALS(10)
190 PRINT @RCA;"INI"
200 '
210 REM PRINT @RCA;"SYS PDC_CP"
220 PRINT @RCA;"PNLMD SYSTEM"
230 PRINT @RCA;"RFINOUT MAIN"
240 PRINT @RCA;"PNLMD TESTER"
250 '
260 PRINT @RCA;"MEAS SETCOM"
270 PRINT @RCA;"DUTCTRL NONE"
280 PRINT @RCA;"MEASOBJ MSTCH"
290 PRINT @RCA;"FREQBAND 800MHZ_1"
300 PRINT @RCA;"CHAN 1"
310 PRINT @RCA;"RFLVL 20DBM"
320 PRINT @RCA;"CHCARR FULL"
330 PRINT @RCA;"PATT S1"
340 '
350 PRINT @RCA;"MEAS TXITEM"
360 PRINT @RCA;"AITEM STD"
370 PRINT @RCA;"MORGNOFS ON"
380 PRINT @RCA;"JORGNOFS ON"
390 PRINT @RCA;"ULORGNOFS -30"
400 '
410 PRINT @RCA;"MEAS TXALL"'          Switches to the TX All Measure screen.
420 PRINT @RCA;"STORAGE NRM"
430 PRINT @RCA;"*CLS"
440 PRINT @RCA;"ADJRNG"
450 '
460 ENDSTS = 0
470 WHILE (ENDSTS AND 2)<> 2
480 FOR I=0 TO 1000: NEXT I
490 PRINT @RCA;"ESR2?"'               Checks the optimization complete state.
500 INPUT @RCA;ENDSTS
510 WEND
520 '
530 PRINT @RCA;"SWP?"'                Starts the measurement.
540 '
550 PRINT@RCA;"JTOTAL?"'              Inquires the overall judgement result.
560 INPUT @RCA;JUDGE$
570 PRINT@RCA;"JORGNOFS?"'            Queries th ejudgement result of origin offset measurement.
580 INPUT @RCA;JORGNOFS$
590 PRINT@RCA;"ORGNOFS?"'             Queries the result of measuring the origin offset.
600 INPUT @RCA;ORGNOFS
```

```
610 '
620 PRINT USING "Total judgement is @";JUDGE$
630 PRINT USING " Origin Offset: @ (###.##dBm)";JORGNOFS$, ORGNOFS
640 END
```

Set TX measurement parameters on lines up to line 390.

Line 410 switches to the TX automatic measurement screen.

Lines 440 to 510 optimize the measurement range.

Lines 550 to 600 read the measurement results.

Lines 620 to 630 display measurement results.

SECTION 8
WAVEFORM DATA STORAGE FORMAT

This section describes the storage format of waveform data fetched by an external computer. The use examples are described in the NEC PC-9800 series N_{88}-BASIC instructions.

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8.1 Notes on Fetching the Waveform Data

(1) Fetching screen

- The waveform data to be fetched must be displayed on the MT8802A screen.
- Check that the measurement terminates before fetching the waveform data. If Continuous measurement mode is set or measurement does not terminate, the correct data cannot be fetched.

Examples of checking measurement termination:

a) In Continuous measurement mode

1. Switch to Single measurement mode.
2. Read the End Event Status Register (ESR2) and check that the measurement terminates.

b) In Average measurement mode

- Read the End Event Status Register (ESR2) and check that both averaging and measurement terminate.

c) In Single measurement mode

- Read the End Event Status Register (ESR2) and check that the measurement terminates.

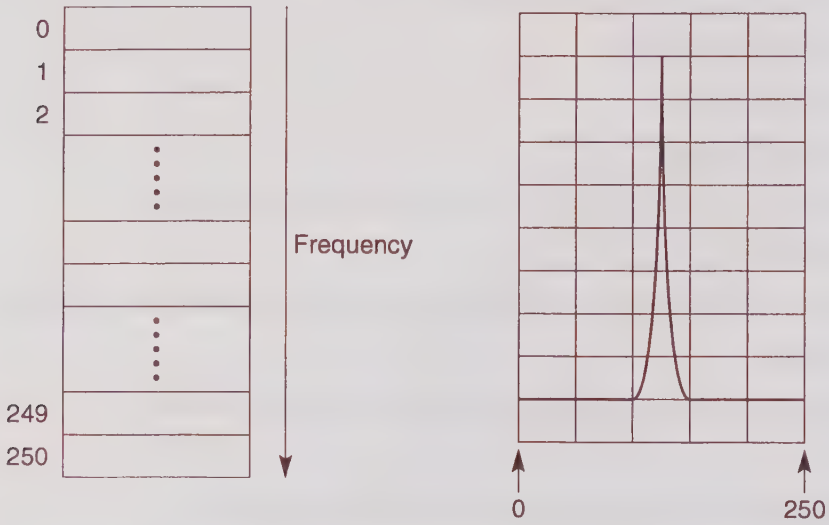
(2) Response data

- When fetching two or more data items together, commas (,) are output as data separators.
- The query command format is designed so that it can fetch all data items together. However, the number of data items actually fetched depends on restrictions placed on the external controller.

8.2 Waveform Data Storage Format

(1) XMB (spectrum measurement waveform of occupied frequency bandwidth measurement and adjacent channel leakage power measurement)

a) Format



- The number of data items depends on the set data point value.
  251 points (0 to 250)
- Correspondence to screen display is as follows:

  Waveform data Yn is displayed as the nth data item on the screen.

b) Range

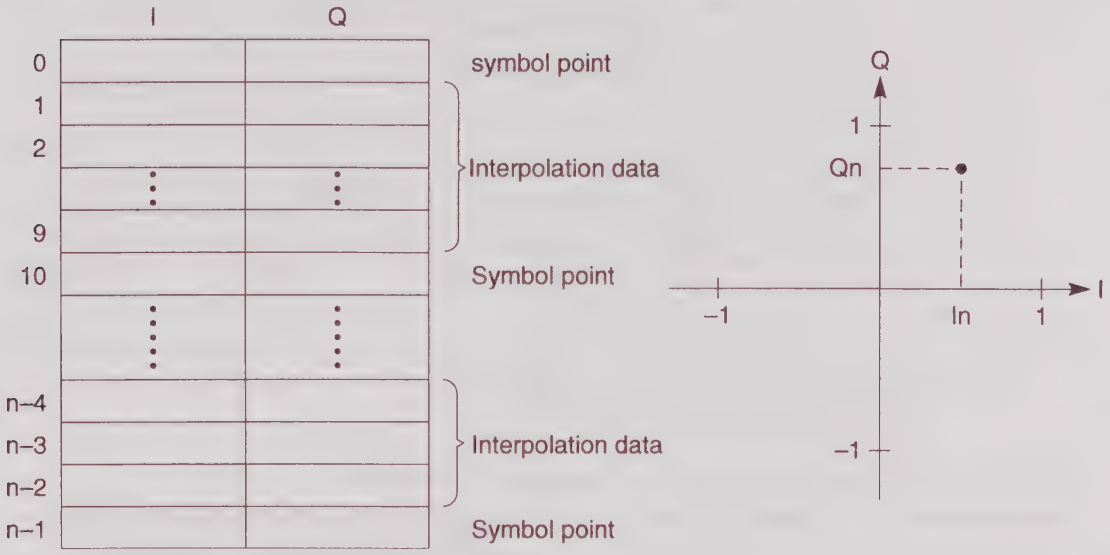
- Displays an integer value in 0.01 dBm units (1 dBm = 100).

c) Use examples

```
PRINT△@1;"XMB△1,2"
INPUT△@1;LVL1,LVL2
```

(2) XMC (constellation measurement waveform of modulation analysis)

a) Format



- Stored with the two-dimensional I-Q data.
- n depends on the measurement signal.
- Correspondence to screen display is as follows (INTERPOLATION mode)

  NON: Dots represent symbol points (0,10,...,n).

  LINEAR: A symbol point is enclosed in a linear line frame (0-10, -...-n)

  10POINT: Dotted lines connect a symbol point and interpolation data (0-1-2-...-n)

b) Range

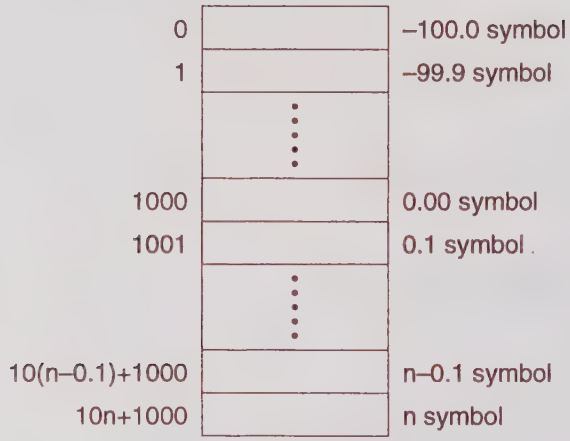
- Displays an integer value in 0.0001 units (ideal signal 1 = 10000).

c) Use examples

```
PRINT△@1;"XMC?△Ø,Ø,1"
INPUT_@1;IØ
PRINT_@1;"XMC?△1,Ø,1"
INPUT_@1;QØ
```

(3) XMD (RF power measurement waveform)

a) Format



- n depends on the measuring system (420 for full rate and 840 for half rate).
- Correspondence to the horizontal axis scale of screen display (RF POWER screen) is on a one-to-one ratio.

b) Range

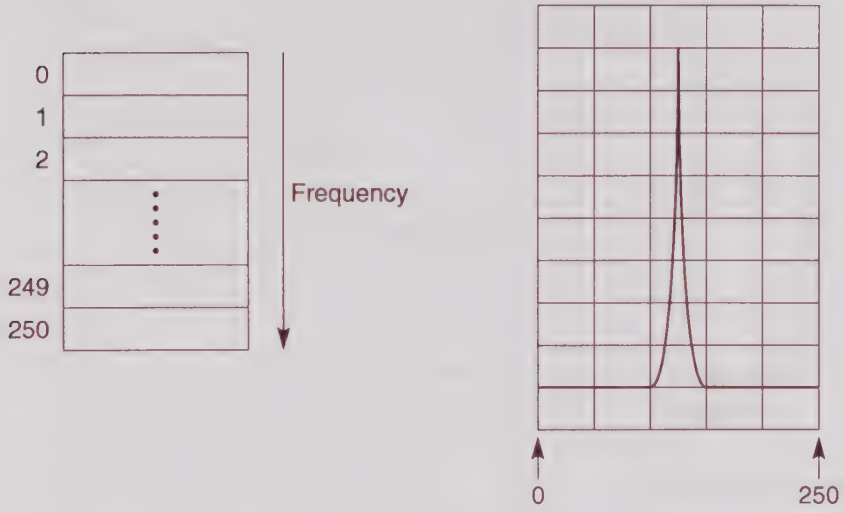
- Displays an integer value in 0.01 dBm units (1 dBm = 100).

c) Use examples

```
PRINT△@1;"XMD?△48Ø,1"
INPUT△@1;LVL
```

(4) XME (High Speed measurement waveform of occupied frequency bandwidth measurement)

a) Format



- The number of data items is fixed to 251 points.
- Correspondence to the horizontal axis scale of screen display (HIGH SPEED method of the occupied frequency bandwidth screen) is on a one-to-one ratio.

b) Range

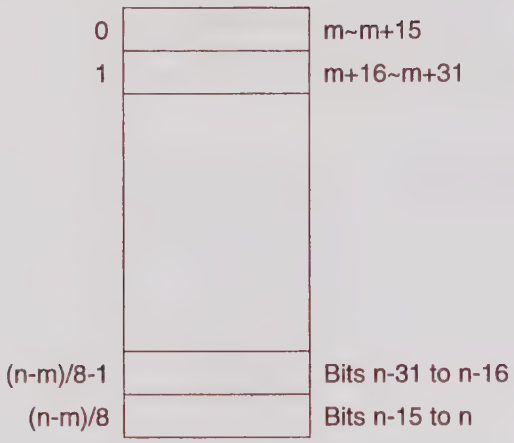
- An integer in 0.01 dBm units (1 dBm = 100) represents the range.

c) Use examples

```
PRINT△@1;"XME?△Ø,Ø"
INPUT△@1;LVL
```

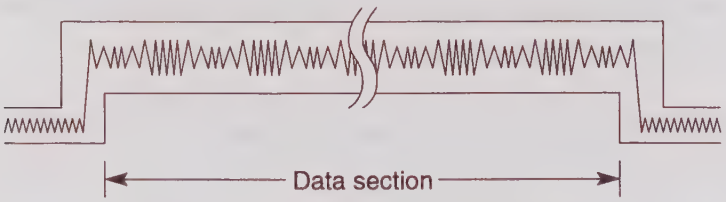
(5) XMM (burst demodulation data)

a) Format



- m and n depend on the measurement system.

[BS-TCH] m = 4, n = 279 (symbols 2 to 139)
[MS-TCH] m = 4, n = 273 (symbols 2 to 136)



b) Range

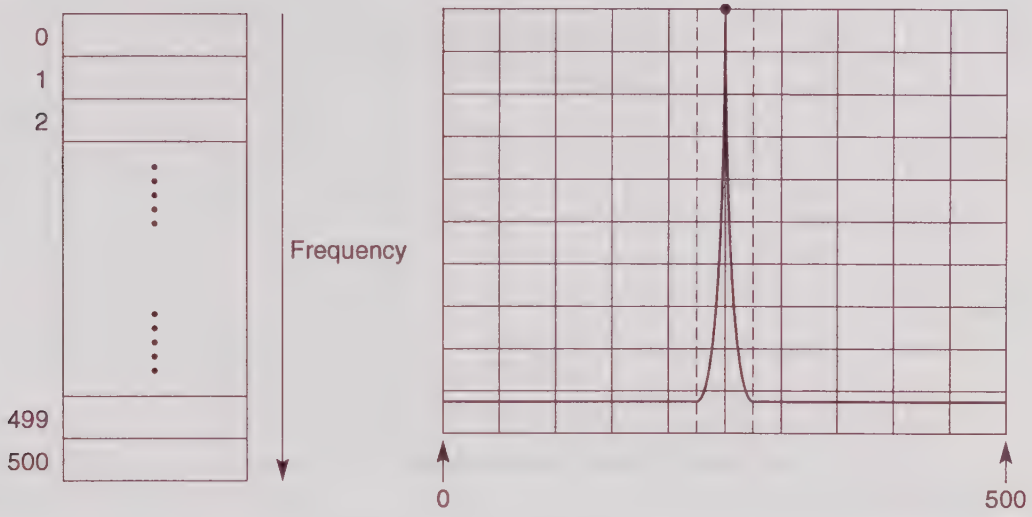
- Data in the demodulation section (delimited in units of 16 bits from the first symbol) is represented by an integer value from 0 to 65535.
- If the demodulation section cannot be divided by 16, the last data is treated as left-justified data with the remaining part padded with 0s.

c) Use examples

```
PRINT△@1;"XMM?△Ø,1"
INPUT△@1;LVL
```

(6) XMAG (Graph measurement waveform of adjacent channel leakage power measurement)

a) Format



- The number of data items is fixed to 501 points.
- Correspondence to screen display is as follows:
  Waveform data Yn is displayed as the nth data item on the screen.

b) Range

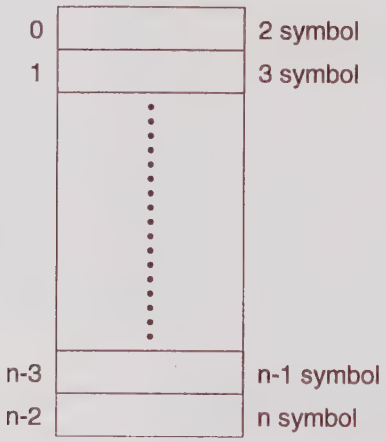
- At LOG scale: An integer in 0.01 dBm units represents the range (1 dBm = 100).

c) Use examples

```
PRINT△@1;"XMAG?△Ø,1"
INPUT△@1;LVL
```

(7) XMN (magnitude error measurement waveform of modulation analysis)

a) Format



- n depends on the measurement system and the Measuring Object.
  [BS-TCH] 139, [MS-TCH] 136
- Correspondence to the horizontal axis scale of screen display (Magnitude error screen) is on a one-to-one ratio.

b) Range

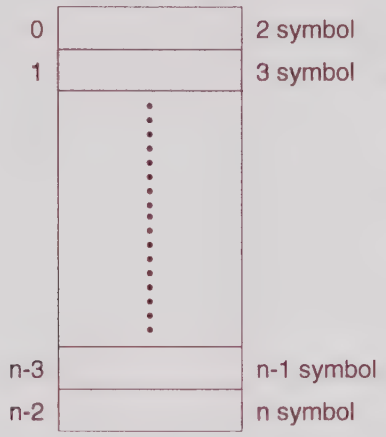
- An integer in 0.01% units represents the range (magnitude error = 1%).

c) Use examples

```
PRINT△@1;"XMN?△1ØØ,1"
INPUT△@1;LVL
```

(8) XMP (phase error measurement waveform of modulation analysis)

a) Format



- n depends on the measurement system and the Measuring Object.
  [BS-TCH] 139, [MS-TCH] 136
- Correspondence to the horizontal axis scale of screen display (Phase error screen) is on a one-to-one ratio.

b) Range

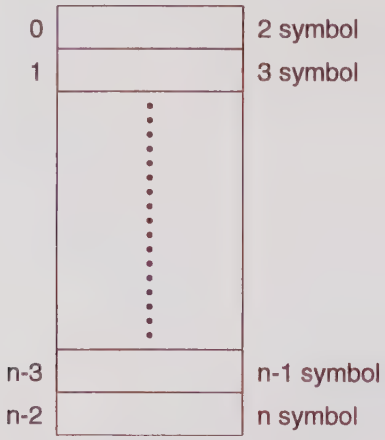
- An integer in a 0.01 degree unit represents the range (phase error of 1 degree: 100).

c) Use examples

```
PRINT△@1;"XMP?△1ØØ,1"
INPUT△@1;LVL
```

(9) XMV (vector error measurement waveform of modulation analysis)

a) Format



- n depends on the measurement system and the Measuring Object.
  [BS-TCH] 139, [MS-TCH] 136
- Correspondence to the horizontal axis scale of screen display (Vector error screen) is on a one-to-one ratio.

b) Range

- An integer in 0.01% units represents the range (vector error of 1% = 100).

c) Use examples

```
PRINT△@1;"XMV?△1ØØ,1"
INPUT△@1;LVL
```

APPENDIXES

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Appendix-II.

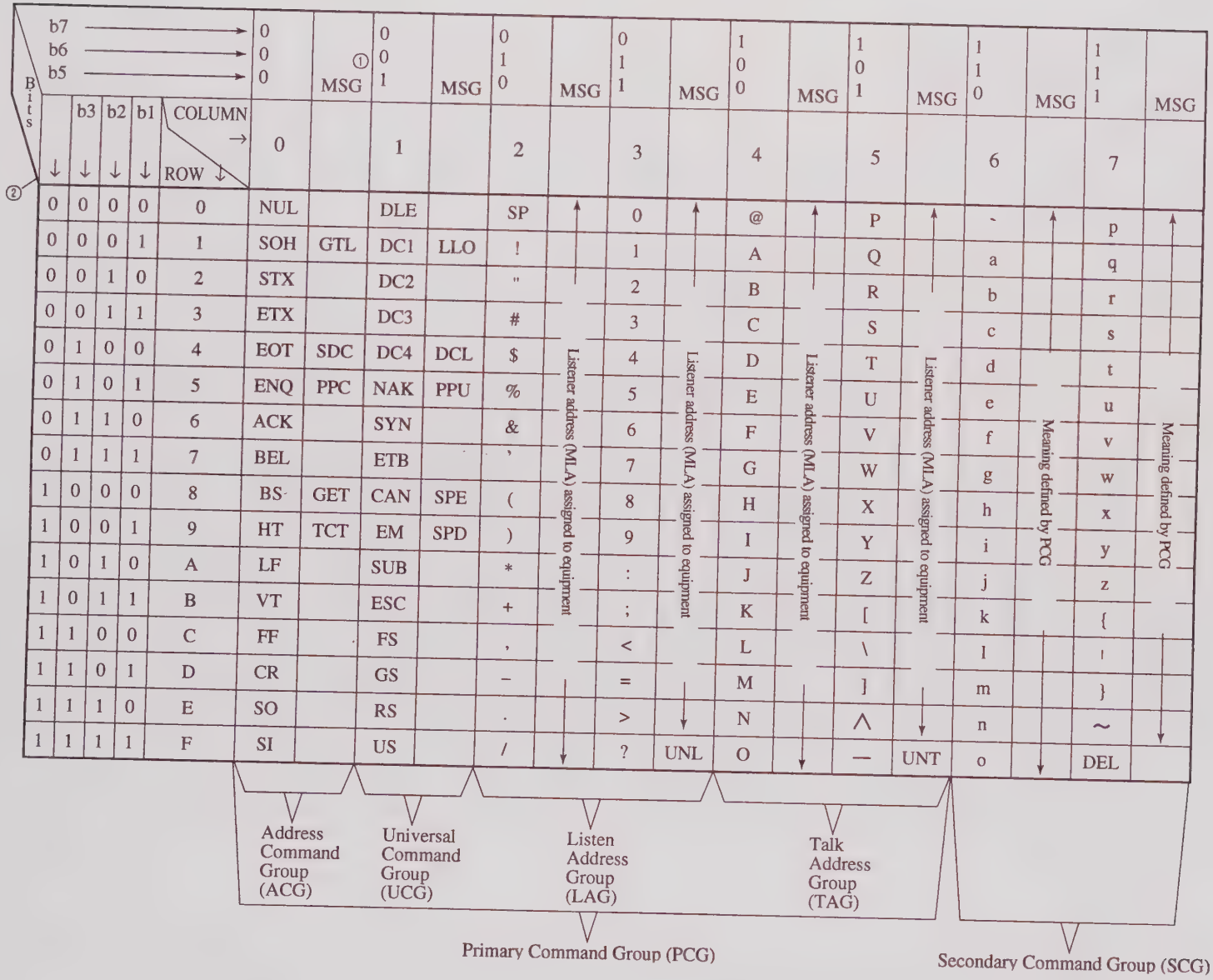
APPENDIX A ASCII* CODE TABLE

B7 B6 B5 / BITS B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 SP 20 32	60 0 30 48	100 @ 40 64	120 P 50 80	140 ` 60 96	160 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LLO DC1 11 17	41 ! 21 33	61 1 31 49	101 A 41 65	121 Q 51 81	141 a 61 97	161 q 71 113
0 0 1 0	2 NUL 2 2	22 DC2 12 18	42 " 22 34	62 2 32 50	102 B 42 66	122 R 52 82	142 b 62 98	162 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 # 23 35	63 3 33 51	103 C 43 67	123 S 53 83	143 c 63 99	163 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 S 24 36	64 4 34 52	104 D 44 68	124 T 54 84	144 d 64 100	164 t 74 116
0 1 0 1	5 PPC ENO 5 5	25 PPU NAK 15 21	45 % 25 37	65 5 35 53	105 E 45 69	125 U 55 85	145 e 65 101	165 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 & 26 38	66 6 36 54	106 F 46 70	126 V 56 86	146 f 66 102	166 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 ' 27 39	67 7 37 55	107 G 47 71	127 W 57 87	147 g 67 103	167 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 (28 40	70 8 38 56	110 H 48 72	130 X 58 88	150 h 68 104	170 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51) 29 41	71 9 39 57	111 I 49 73	131 Y 59 89	151 i 69 105	171 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 2A 42	72 : 3A 58	112 J 4A 74	132 Z 5A 90	152 j 6A 106	172 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 + 2B 43	73 ; 3B 59	113 K 4B 75	133 [5B 91	153 k 6B 107	173 { 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 , 2C 44	74 < 3C 60	114 L 4C 76	134 \ 5C 92	154 l 6C 108	174 | 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 - 2D 45	75 = 3D 61	115 M 4D 77	135] 5D 93	155 m 6D 109	175 } 7D 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 . 2E 46	76 > 3E 62	116 N 4E 78	136 ^ 5E 94	156 n 6E 110	176 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	77 ? 3F 63	117 O 4F 79	137 UNT _ 5F 95	157 o 6F 111	177 RUBOUT (DEL) 7F 127
	Address command	Universal command	Listen address		Talk address		Secondary address or command	

KEY octal / hex: 25 PPU / NAK / 15 21 — GPIB code, ASCII character, decimal

*American Standard Code for Information Interchange

Table A-1 GPIB Interface Messages (Extended)



b3	b2	b1	ROW	000	MSG	001	MSG	010	MSG	011	MSG	100	MSG	101	MSG	110	MSG	111	MSG
			COLUMN →	0		1		2		3		4		5		6		7	
0	0	0	0	NUL		DLE		SP		0		@		P		`		p	
0	0	0	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	STX		DC2		"		2		B		R		b		r	
0	0	1	1	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	ENQ	PPC	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	BEL		ETB		'		7		G		W		g		w	
1	0	0	0	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	VT		ESC		+		;		K		[		k		{	
1	1	0	0	FF		FS		,		<		L		\		l		|	
1	1	0	1	CR		GS		-		=		M		]		m		}	
1	1	1	0	SO		RS		.		>		N		^		n		~	
1	1	1	1	SI		US		/		?	UNL	O		_	UNT	o		DEL	

Notes:

① MSG=INTERFACE MESSAGE (Sent by ATN of True, Low level)

② b1=DI01...b7=DI07 (b1 through b7 correspond to DI01 to DI07 sequence.)GTL

SDC	Go to Local
PPC	Select Device Clear
GET	Parallel Poll Configure
TCT	Group Execute Trigger
LLO	Take Control
DCL	Local Lockout
PPU	Device Clear
SPE	Parallel Poll Unconfigure
SPD	Serial Poll Enable
UNL	Serial Poll Disable
UNT	Unlisten
(ACG)	Untalk
(UCG)	Addressed Command Group
(LAG)	Universal Command Group
(TAG)	Listen Address Group
(PCG)	Talk Address Group
(SCG)	Primary Command Group
	Secondary Command Group

Table A-2 Interface Message Groups

D 1 0 8	D 1 0 7	D 1 0 6	D 1 0 5	D 1 0 4	D 1 0 3	D 1 0 2	D 1 0 1	Interface message group (G)
×	0	0	0	b4	b3	b2	b1	Addressed command G
×	0	0	1	b4	b3	b2	b1	Universal command G
×	0	1	b5	b4	b3	b2	b1	Listen address G
×	0	1	1	1	1	1	1	Unlisten (UNL)
×	1	0	b5	b4	b3	b2	b1	Talker Address G
×	1	0	1	1	1	1	1	Untalk (UNT)
×	1	1	b5	b4	b3	b2	b1	Secondary command G

Table A-3 Address Assignments

Address character		Address swich setting					Primary address	Factory address set device
Talk	Listen	5	4	3	2	1		
b_7 b_6	b_7 b_6	b_5	b_4	b_3	b_2	b_1		
1 0	0 1	↓	↓	↓	↓	↓	Decimal	
@	SP	0	0	0	0	0	0	
A	!	0	1	0	0	1	1	
B	"	0	0	0	1	0	2	
C	#	0	0	0	1	1	3	
D	$	0	0	1	0	0	4	
E	%	0	0	1	0	1	5	
F	&	0	0	1	1	0	6	
G	'	0	0	1	1	1	7	
H	(	0	1	0	0	0	8	
I	)	0	1	0	0	1	9	
J	*	0	1	0	1	0	10	
K	+	0	1	0	1	1	11	
L	,	0	1	1	0	0	12	
M	-	0	1	1	0	1	13	Printer
N	.	0	1	1	1	0	14	Plotter
O	/	0	1	1	1	1	15	
P	0	1	0	0	0	0	16	
Q	1	1	0	0	0	1	17	
R	2	1	0	0	1	0	18	
S	3	1	0	0	1	1	19	
T	4	1	0	1	0	0	20	
U	5	1	0	1	0	1	21	
V	6	1	0	1	1	0	22	
W	7	1	0	1	1	1	23	
X	8	1	1	0	0	0	24	
Y	9	1	1	0	0	1	25	
Z	:	1	1	0	1	0	26	
[	;	1	1	0	1	1	27	
\	<	1	1	1	0	0	28	
]	=	1	1	1	0	1	29	
^	>	1	1	1	1	0	30	
?	_	1	1	1	1	1	31	UNL,UNT

APPENDIX B COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

Function	Controller			
	PACKET V (Anritsu)	PC-9800 series (NEC)	IBM-PC	HP9000 series
Outputs data to a device	WRITE @ device number; data	PRINT @ listener address; data	CALL IBWRT( )	OUTPUT device selector;data
Outputs binary data to a device	BIN WRITE @ device number; data	WBYTE command;data		
Assigns data entered from a device to a variable	READ @ device number:variable	INPUT @ talker address, listener address;variable LINE INPUT @ talker address, listener address;variable	CALL IBRD( )	ENTER device selector;variable
Assigns binary data entered from a device to a variable	BIN READ @ device number; variable	RBYTE command;variable		
Initializes an interface function	IFC @ select code	ISET IFC	CALL IBSIC( )	ABORT select code
Turns REN line on	REN @ select code	ISET REN	CALL IBSRE( )	REMOTE device selector (select code)
Turns REN line off	LCL @ select code (sets all devices local) LCL @ device number (sets only specified devices to listeners, and sends out GTL command)	IRESET REN WBYTE &H3F,listener address,secondary address,&H01;	CALL IBSRE( ) CALL IBLOC( )	LOCAL device selector (select code) LOCAL device selector (select code + primary address)
Outputs interface messages (messages) and data	COMMAND @ select code : character string for message [;data]		CALL IBCMD() CALL IBCMDA() (asynchronous)	SEND select code ;message string
Triggers a specified device	TRG @ device number	WBYTE &H3F,listener address,secondary address,&H08;	CALL IBTRG( )	TRIGGER device selector

Function	Controller			
	PACKET V (Anritsu)	PC-9800 series (NEC)	IBM-PC	HP9000 series
Initializes devices	DCL @ select code (all devices bearing a specified select code) DCL @ device number (specified devices only)	WBYTE &H3F,&H14; WBYTE &H3F, listener address, secondary address,&H04;	CALL IBCLR( )	CLEAR device selector (selector code) CLEAR device selector (selector code + primary address)
Disables a device from being switched over from remote to local	LLO @ select code	WBYTE &H3F, &H11;		LOCAL LOCKOUT
Transfers control to a specified device	RCT @ device number	WBYTE talker address, &H09;	CALL IBPCT( )	PASS CONTROL
Sends out a service request	SRQ @ select code	ISET SRQ	CALL IBRSV( )	REQUEST select code
Performs serial polling	STATUS @ device number	POLL	CALL IBRSP( )	SPOLL (device selector) (function)
Sets a terminator code	TERM IS	CMD DELIM	CALL IBEOS( ) CALL IBEOT( )	
Sets a limit value for checking a timeout		CMD TIMEOUT	CALL IBTOM( )	

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• The numbers on the right indicate section and paragraph numbers in this operation manual.

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MP MASTER
MA35884